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ARTICLE I.

ON OPENING AND DRAINAGE OF ABSCESS CAVITIES IN THE BRAIN. ILLUSTRATED BY A CASE.

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THE antiseptic method of operating and after-treatment, which has been so great a gain to the art of surgery, has not as yet been tested to a full extent in operations upon the brain. This is natural, for not only have we inherited a just dread of dealing with an organ, the large majority of whose diseases are dangerous or fatal, but, our knowledge of the physiological functions of the brain and of their pathological modifications being extremely limited, we are not in a position to form an accurate diagnosis of such pathological conditions of the organ as call for surgical interference. However, during the latter decennium, science has vigorously attacked the problem, and the brilliant monograph by v. Bergman *On Injuries to the Head*, gives promise that exact observations and pathological experiments will, in time, enable us somewhat to penetrate the obscurity in which the subject now lies.

We shall, in this paper, confine our remarks to traumatic cerebral abscess and to such surgical points, their diagnosis and treatment, as may receive some elucidation from the following case.

The principal authors who have written on abscess of the brain (Abercrombie, Lallemand, Griesinger, Bruns, Lebert), nearly all come to the

conclusion that it is a necessarily fatal disease. Although some of them, and among them Bruns, were unwilling to deny the possibility of a spontaneous resolution, yet nobody had ever been able to furnish a proof thereof, until Rose, of Berlin, formerly of Zürich, published a case (Langenbeck's *Archiv f. kl. Chir.*, Bd. 27, Heft 3, S. 529, Ueber Trepanation beim Hirnabscess), in which Wilms had made a diagnosis of cerebral abscess consequent upon internal otitis.

The patient, who was a child, recovered. Many years afterwards the patient died as an adult of croupous pneumonia. The *post-mortem* examination revealed five or seven cavities in the brain, the remains of multiple abscesses; these cavities were lined with a thick connective-tissue membrane and filled, one with a serous fluid, the others with cheesy matter. Rokitansky, as early as 1846, writes (*Path. Anat.*, Sydenham ed., vol. iii. p. 414), that cerebral abscess, though usually fatal, may be completely cured.

This possibility of spontaneous resolution, together with the possibility of spontaneous evacuation by ulceration upwards through the vault of the cranium, or downwards into the orbital or nasal cavity, furnish the best justification of the surgeon's non-interference with the disease; but when we consider how exceedingly rare is the spontaneous cure of brain abscess, this justification must appear rather slender. In the great majority of cases, the surgeon is deterred by the difficulties of the diagnosis. The symptoms of commotion of the brain and of fractures are recognized with comparative ease, but the symptoms of lepto-meningitis (inflammation of pia mater), and of emmollition or encephalitis proper so closely resemble those of cerebral abscess that the formation of an accurate, differential diagnosis often becomes an impossibility. Thus we read of a number of cases in which trephining was performed with a view to evacuate an abscess, and in which the disease afterwards found to exist was meningitis or encephalitis. In not a few of the cases of meningitis (Rivington, Gross, Shallon) the patients died in from three to twenty-four hours after the operation. Such experience naturally makes the surgeon reluctant to have recourse to the trephine, and it does so, perhaps, more than is justifiable, acute lepto-meningitis being as necessarily fatal as cerebral abscess, if not even more so. Under such doubtful circumstances the operation of trephining will, in case the disease be lepto-meningitis or encephalitis, cut off some hours of more or less unconscious life, but, on the other hand, if an abscess should be present, it may save the patient's life. The aspect of things is widely different in such cases as Dentu's, in which trephining and opening of the dura mater may be assigned as the causes of a subsequent and not pre-existent fatal lepto-meningitis.

We are, however, convinced that such disastrous consequences can be prevented by antiseptic precautions, at all events in cases in which it is possible strictly to observe them. This may, indeed, considering the insane violence of patients suffering from brain disease, in many instances prove

a matter of exceeding difficulty. We shall consider this point thoroughly in another place. Bergman, in discussing the treatment of cerebral abscess, unhesitatingly sets it down as an axiom that wherever there is an accumulation of pus, trephining is most clearly and indubitably indicated, for the opening of an abscess in the brain is as necessary as in any other part of the body," and we would add, even more so. A correct diagnosis of abscess having been made, the further difficulty presents itself of locating it with sufficient accuracy, so as to be able to find it. A number of cases are on record (Bergman cites more than half a dozen), in which a correct diagnosis had been made, the trephine also put on more or less at the right place, but the knife or trocar, the instruments usually employed for the purpose, passing into the brain and near the walls of the abscess, nevertheless missed it. We intend to show by the following case, that this difficulty can be obviated by multiple exploratory aspirations, performed at interstices sufficiently small to prevent any abscess from escaping detection; even if the trephine opening should not have been made at the point of the skull nearest the abscess.

There still remain to be considered a large number of cases of cerebral abscess on record, in which trephining was performed, pus evacuated, and temporary relief obtained, even commencing convalescence; but later on relapse followed, and the cases came to a fatal termination. It is possible, judging from the success the practice has met with in the treatment of abscesses in other situations, that drainage of the cerebral abscess-cavity, with or without washing out, would have saved some of these cases, by preventing the reaccumulation of pus and the continuous infection of the surrounding brain tissue, the acute œdema of which is well known to be, as a rule, the final cause of death. As far as we are aware, draining and washing out of cerebral abscess-cavities has heretofore not been tried; that it can be effected and, to say the least, without any detriment to the patient, will be shown by the following case:—

CASE.—Police officer Pat. Mulvihill, of the Chicago police force, received, on December 3, 1882, about two o'clock P. M., while attempting to effect the arrest of a criminal, a pistolshot-wound over his left eyebrow. The bullet, as near as could be ascertained, of calibre 32, struck the barrel of Mulvihill's pistol, and glancing off, entered the left supraorbital region. The shot had been fired at a distance of ten or fifteen feet. Patient felt the bullet strike his head, and immediately fell to the floor insensible. He lay thus for about a minute, when, coming to, and feeling but slight pain, he arose and walked up and down the room. A patrol-wagon was called, patient walked up to it, got in, and was taken to his residence, about one-half a mile distant, where the wound was dressed. At that time patient could still see with his left eye.

Dr. Howe, who was called, found a small wound of entrance over the left supraorbital margin where its middle and outer third join. He introduced a probe and discovered that the bone of the margin had been fractured; following the subcutaneous track of the bullet upwards and outwards for about 2 cm., he distinctly felt a hard body lodged beneath the

skin. This was cut down upon, and an irregularly shaped piece of lead extracted. The wound was washed out with a 2½ per cent. solution of carbolic acid, a small drainage-tube drawn through the whole length of the canal, and an antiseptic dressing applied. Towards evening the lids of the left eye had become œdematous to such a degree that, their separation being impossible, the doctor was compelled to refrain from making an examination of the eyeball.

No unfavourable symptoms appeared for 48 hours; patient had no pain, and pulse and temperature remained normal.

Dec. 6. In the morning patient complained of intense headache, especially on the left side of the head, and of pain in the depth of the orbit. Temp. 99.5°. He had vomited once the night before. On removing the dressing, no evidences of suppuration were seen; a slight swelling was noticeable along the track of the wound; the œdema of the lids was considerable. Prof. Holmes, of the Eye and Ear Infirmary, examined the eye afterwards, and found, on separating the lids, a moderate degree of exophthalmus. Patient stated that he had lost vision in his left eye; solution of atropia was dropped into it.

During the subsequent two days the orbital pain and headache continued to increase; but there was no vomiting; nor did other brain symptoms appear. The wound now commenced to discharge freely. Patient was placed under the care of Dr. Lee, who called in Dr. Fenger.

9*th*. Temp. 102.5°. Headache steadily increasing. On account of these symptoms, we anæsthetized patient and operated upon him, assisted by Dr. J. B. Murphy, who had just returned from Vienna, as follows: An incision starting from the entrance-opening was carried forwards for an inch through the canal of the wound, ending at the point where the bullet had been excised; a second one, beginning at the entrance-opening, was made half an inch downwards through the eyebrow, and running under the margin of the orbit. This revealed a comminuted fracture of the supraorbital ridge. A number of small pieces of lead were found among the fragments of bone, and a few of them, impacted in fissures of the ridge, could be removed only by chiselling off the irregular edges of the fracture. An opening was then discovered leading into the frontal sinus; but the probe failed to detect any fracture of, or to find any passage through, the lamina interna into the cranial cavity. A small abscess-cavity in the roof of the orbit gave exit to about two drachms of pus; but no fracture could be detected there. After washing the wound with a 2½ per cent. solution of carbolic acid, a large drainage-tube, 7 mm. in diameter, was inserted in the abscess-cavity, and a smaller one along the track of the wound, the edges of which were united over the tube by sutures. An antiseptic dressing was put on, and the wound syringed twice daily with a 2½ per cent. solution of carbolic acid.

10*th*. Temp. 100.5°. A little sickness caused by the ether, otherwise patient has improved; orbital pain and headache have greatly diminished; œdema of the eyelids and conjunctiva bulbi as before.

14*th*. Pulse and temp. normal; no headache, no pain; discharge from wound has diminished.

24*th*. Patient feels perfectly well; sleeps quietly all night; has a good appetite; leaves his bed and walks about the house, even up and down stairs. Now and then, but not every day, he is seized with slight attacks of headache, extending over the left side from the frontal to the occipital

region. This headache, never accompanied by vomiting or dizziness, would last from two to four hours. Patient's eye could perceive light.

30*th*. Pulse and temp. normal. Patient complains of headache and nausea; he is put on liquid diet and physic.

31*st*. Headache and nausea have disappeared.

1883. *Jan.* 5. Pulse and temp. normal; no headache since; the wound has healed down to the apertures for the tube.

As the patient felt restored, he went out of doors for the first time since reception of the injury, intending to take a ride in a cutter. While in a police-station which he visited, he began to feel faint. This was about 1 o'clock P. M. He then took a car and rode home. He subsequently vomited, and, feeling a pain in the left half of his head, went to bed. In the evening, pulse 70, temp. normal; he complained of headache and of a feeling of depression; he frequently sighed, but when questioned answered intelligently.

6*th*. Pulse 68, and full; temp. normal; headache and nausea persistent; intellect rather dull, but answers still intelligible.

7*th*. Headache continues; nausea has somewhat diminished; pulse 63, and increasing in volume; temp. normal; intellect exceedingly dull.

The pulse now kept falling slowly, the temperature remained normal, and patient became more and more comatose. However, he still answered questions. There was no aphasia, and no paralysis.

11*th*. Evening. Pulse, 54; temp. 99.5°. The coma had reached such a degree that patient could be roused only with difficulty.

12*th*. Patient is in profound coma, and has involuntary discharges of urine. Pulse, 56; temp. 99°.

The Operation.—Increasing coma, accompanied by a slow pulse and almost normal temperature, clearly indicated augmented intercranial pressure. This might have been due to:—

1. An abscess or collection of pus which had formed between the cranium and dura mater, somewhere in the vicinity of a possible fracture at the seat of the injury; or,

2. An acute meningitis spreading from the seat of the injury; or,

3. An abscess of the brain, in spite of the absence of local symptoms. Such an abscess would probably be located in the frontal lobe, not far from the seat of the injury.

In our opinion, the normal state of temperature pointed rather to an abscess than to meningitis. Under these circumstances, we deemed it advisable to resort to trephining.

Patient was laid on a table. As the coma seemed sufficiently profound to substitute anæsthesia, no ether was administered. The left eyebrow and the left half of the head were shaved, and the skin cleaned with soap and nail-brush and a 5 per cent. solution of carbolic acid. The knife was entered at the original wound of entrance, 2 cm. to the inner side of the linea semicircularis superior, and then passed directly upwards for a distance of two inches, cutting through the galea and periosteum. The trephine employed had a diameter of 17 mm.; it was placed as follows: its lower border 2 cm. above the supraorbital margin, in order to be sure of avoiding the frontal sinus; its inner border 4 cm. to the left side of the median line, and its outer border 1 cm. to the inner side of the linea semicircularis.

The piece of bone removed presented no fracture, and was perfectly healthy; the underlying dura mater was of normal colour, but tense, so as

to protrude into the trephine-opening; no distinct pulsations were visible. A crucial incision was made in the dura mater, but no pus met with between it and the arachnoid. The arachnoid and pia mater presented their normal color, and there was no trace of meningitic exudation. A hypodermic needle, attached to an ordinary hypodermic syringe, was now used to make a succession of exploratory punctures. We first pushed the needle downwards towards the roof of the orbit, whence nothing was withdrawn but a little blood and débris of brain-substance. We then introduced it successively in a horizontal, backward, inward, and outward direction, the result remaining the same. Concluding that the abscess lay at a depth beyond the reach of our needle, we exchanged it for one of greater length. This long needle was entered in a direction backwards, slightly inwards, and perhaps a trifle upwards; on reaching a depth of 2–2½ inches, the syringe filled with a thin, palish-red, and semi-transparent fluid. Poured into a wineglass, it emitted a peculiar odour, not distinctly fetid, and somewhat phosphorescent. The needle was pushed in a second time, in the same direction and to the same depth, and again the syringe filled with the same fluid. The needle was now used as a guide, along which the closed blades of a pair of narrow operating forceps were pushed in, and were then withdrawn. On separating the blades of the forceps, 1–1½ ounces of the above-described reddish, opaque, thin fluid spurted out with some force, followed by at least a teaspoonful of thick, yellow pus. A fenestrated tube, 10 cm. long, 8 mm. in diameter, and 6 mm. lumen, was introduced into the wound in a direction backwards, a little upwards, and somewhat towards the median line. This tube lay within the dura mater to the extent of 8 cm., and immediately discharged four or five drops of pus; its free end was secured with a disinfected safety-pin. A second drainage-tube was inserted along the roof of the orbit, where, however, no additional pus was discovered. The superfluous borders of wound were stitched together, and a thoroughly antiseptic dressing applied, the opening being covered with a piece of protective silk. The external wound and drainage-tubes were dusted over with iodoform, and patient put to bed.

Two hours after the operation, the pulse had risen to 64; three hours later, consciousness returned; and patient answered questions in a slow but coherent manner.

13*th*. Pulse, 68; temp. 101.5°. No headache; no nausea. Patient is dressed in a recumbent position, as he feels faint when attempting to assume a sitting posture. The abscess-cavity was washed with a saturated solution of boracic acid by means of a gentle stream from a fountain-syringe. The drainage-tube was taken out, cleaned, and replaced.

Patient was dressed twice daily for two weeks. From Jan. 15 to Jan. 30, patient improved steadily; pulse and temperature had become normal and intelligence perfect. Patient no longer complains of headache, sleeps well, and has an excellent appetite. His bowels being somewhat constipated, an aperient had to be given every other day, else a slight headache would reappear.

He was kept on liquid diet and maintained in a strictly recumbent position. The drainage-tube was gradually shortened down to 4 cm., attempts to push it in deeper meeting with resistance.

Feb. 12. Although patient has strictly kept his bed, he again begins to complain of slight headache and nausea, for which there is no apparent provocation. Morning temp. 98.5°; evening temp. 99.5°.

A week later patient's pulse began to fall slowly but steadily, at the same time increasing in volume; patient was relapsing gradually into a condition of stupor.

20*th*. Pulse, 64; temp. 99°. Patient complains of headache and nausea, and is in a semicomatose condition.

Operation.—We inferred, from this reappearance of brain symptoms, that the remaining length of the tube, 4 cm., was insufficient to drain the cavity of its pus; or that some pocketing of matter had taken place, causing intracranial pressure and coma.

Patient was slightly anæsthetized, and the wound dilated from the opening for the tube. The long hypodermic needle, attached to a syringe, was then introduced four or five times in different directions to a depth of two and a half or three inches; nothing was drawn but a little blood and some débris of brain-substance. Finally, the needle being directed towards the old cavity, about half a teaspoonful of thick, yellow pus entered the syringe. A drainage-tube 6 cm. long was inserted in this direction, the wound dusted over with iodoform, and an antiseptic dressing applied.

21*st*. Pulse, 66; temp. 99.5°. Some nausea, possibly caused by the ether; less headache.

22*d*. Pulse, 66; temp. 99°. Still less headache; no nausea. Now and then, for about a week, patient has had an involuntary passage of urine.

23*d*. Pulse, 70; temp. 98.5°. Intelligence begins to return, but slower than after the preceding operation.

The discharge from the abscess-cavity now steadily diminished in amount, and grew more serous. In two weeks, however, it began to reassume a more purulent character. We therefore discontinued the use of boracic acid in washing out through tube, and substituted a weak solution of carbolic acid and thymol, which again reduced the quantity of the discharge. The drainage-tube was shortened every third day. Patient progressed steadily.

April 10. Drainage-tube is removed.

15*th*. Patient leaves his bed.

30*th*. Patient takes a walk out of doors.

May 15. Patient attends to his duties as a police officer. He complains of no headache, has no feeling of weakness in his head, and thinks it is as strong as ever; he has an unnatural sensation, but no pain in the left parietal region; no swelling of the eyelids is seen, but there is ptosis of the upper one, which, however, is diminishing steadily. There is no strabismus; conjunctiva, cornea, and iris are of normal appearance. Patient has a feeling of slight tenseness over the left eyebrow; he is unable to use his left eye in reading, but can count fingers at a distance of 2 feet and a half. A red cicatrix, 5 cm. long, stretches from the supraorbital margin upwards and a little outwards over the frontal region. There is a pulsating defect in the cranium where the trephine was applied, 2 cm. above the superior margin of the orbit and 4 cm. to the left of the median line; this defect has a diameter of one cm.; pressure upon it causes no pain. Memory and speech, and all faculties of the brain, are as good as ever. Patient states that he gets tired in a shorter time than before sustaining the injury, and that, as yet, he feels a little less lively than he used to. His appetite is good, and his bowels move regularly.

Patient continued to do light in-and-out-door policeman's work. In

July, 1883, he was laid up for about ten days, having had three epileptic fits; he also complained of headache over the left frontal region.

In December he was again seized with a fit of epilepsy; he fell while about to take a seat at the supper table.

Since that time patient has had no fits, and he has been able to attend to his work as usual. During the last two months the pain in the frontal region has become less frequent and diminished in intensity. It now comes twice or three times a month and lasts from three to four hours.

He sleeps well and eats well. His memory and all cerebral functions are unimpaired. He complains of loss of endurance; says that he is easily fatigued. On March 2, 1884, a fistula presented itself where the trephine opening had been made. This fistula discharges five to ten drops of pus in the twenty-four hours.

Discussing cerebral abscess with regard to the above case, we shall treat of—

1. Symptoms and diagnosis;
2. The operation of trephining;
3. The exploratory puncture and aspiration;
4. Drainage of brain abscess.

1. *Symptoms and Diagnosis.*—Without going into unnecessary details concerning cerebral abscess in general, we shall merely call attention to the main points touching our case which, with Bergman, we will call one of chronic traumatic abscess. As might have been expected from a case of limited injury to the brain with slight impetus, the primary cerebral symptoms were, unconsciousness of little more than a minute's duration. The so-called latent period devoid of all brain symptoms, continued about four weeks. The third stage then set in with secondary brain symptoms, headache and coma. Thus far the course of symptoms indicated that we were dealing with a case of cerebral abscess, but in this, as in so many other cases of its kind, there appeared nothing in the secondary brain symptoms sufficiently characteristic to enable the diagnostician to distinguish them clearly from the similar symptoms of encephalitis or secondary meningitis. The headache was not distinctly more intense in the region of the wound than in the entire left half of the head. The rise in tempeperature was slow, taking three days to reach 102.5°, in no respects differing from the rise in temperature in incipient meningitis; differing, however, from what would take place in a case of pyæmia.

The principal clinical symptoms of cerebral abscess are besides headache, vomiting, coma, and fever, according to Bergman local symptoms (Heerdsymptome, focal symp.); more or less complete paralysis, usually of the opposite, more rarely of the corresponding side of the body, epileptic fits, spasms, etc. The paralysis or paresis, as is well known, is especially valuable, when limited or gradually increasing. Local symptoms (Heerdsymp.) were altogether absent in our case; but it should be remembered that we can understand and interpret them only when coming from the comparatively small area in the middle third of the brain, called the psy-

cho-motor centres. And in lesions of the brain on the left side which, on account of the centre for speech, is the more favourable, local brain symptoms from this circumscribed region, will, as seen in our case, fail to appear, unless the abscess affect the gray substance of those very convolutions.

Recent observations have furthermore shown that local brain symptoms (Heerdsymp.) may be met with in cases of meningitis, originating in the psycho-motor area. It is readily seen that, if an unerring diagnosis is required of the surgeon who proceeds to trephining for cerebral abscess, abscesses in the brain will be evacuated only when pus presents itself at the bottom of the wound, either spontaneously, or on removal of a depressed, penetrating spicula of bone. Indeed, a great number of successfully opened abscesses were just such cases.

Of the opening of abscesses that do not thus visibly present themselves, or are, furthermore, located at some distance from a pre-existent wound, we shall more properly speak under the head of—

2. *The Operation of Trephining.*—Is trephining at the present day, aided, as we are by the antiseptic method, still so formidable an operation that, considering the unavoidable uncertainty of the diagnosis, its performance for deep-seated cerebral abscess cannot be pronounced justifiable? Estlander tells us (Virchow and Hirch., *Jahresbericht.*, Jahr. 1879, Bd. 2, Abth. 2, S. 390), that, since the introduction of the antiseptic method, the percentage of deaths in cases of cranial fractures with cerebral injury, has fallen from 66 to 17; and there is good reason for trusting that thoroughly aseptic wounds will depress the rate of mortality considerably below this figure. In these operations, life and death are, of course, to a certain extent in the hands of the operator.

We learn from statistics published by Blum (Langenbeck's *Archiv*, Bd. XIII. S. 489) that out of 44 cases in which trephining was performed for abscess of the brain, 22 recovered.

The fatality of the disease, when left to itself, comes near 90 or even 100 per cent. A reduction of this frightful death-rate by almost one-half clearly seems to advocate the operation. Still, as to the advisability of this operation, surgeons will take opposite sides, and Sir A. Cooper's dread of even removing a depressed spicula of bone from the brain, a consequence of disastrous experience, can be traced through surgical literature down to the present day. Rose, as late as 1881, tries to avoid trephining for cerebral abscess (*l. c.*, p. 558), trusting to the faint hope of resolution or spontaneous evacuation. Aseptic trephining, and we should remark that Rose invariably uses the open-air method of treating wounds, undoubtedly deserves to be given an impartial trial, before abscesses in the brain, left to themselves, are allowed to run their fatal course.

We conclude from prior reasons and learn from experience, that if the brain be healthy, the dangers of aseptic trephining can be greatly lessened

by the care and skill of the surgeon. But the objection to operative interference in cases of suppurating leptomeningitis or emmollition, *i. e.*, encephalitis, are to be seriously considered. How large a proportion of deaths is to be attributed to the incalculable influence of the shock, in giving additional impetus to an existing meningitis or encephalitis it is, of course, impossible to determine. However, it should not be forgotten first, that these diseases are in themselves exceedingly grave, the prognosis of (Bergman, *l. c.* 155), traumatic diffuse, suppurating leptomeningitis being the worst imaginable, namely death; and second; that trephining performed under the gravest, we should say, premortal symptoms of intracranial pressure from abscess, has, in a number of cases, been followed by prompt relief. The dangers, apart from the shock, cannot very well have any other source than phlogogeneous substances introduced into the diseased organ through the trephining wound. It is more than possible that the antiseptic method will prove no less preventative of additional inflammation in cerebral operations than it already has done and does, as seen in every day's experience, in the opening of cold abscesses from caries of deep-seated bones, of hepatic abscess, of empyema, etc.

As to the place where the trephine should be applied, we can only say that it should be chosen as near the seat of the presumed abscess as possible. The difficulties of finding the right place culminated, so to speak, in a case cited by Gross (*System of Surg.*) A soldier had received a gunshot injury, and 17 days afterwards was suddenly taken with convulsions and coma; five perforations were made with the trephine, but no pus evacuated. The autopsy revealed diffuse leptomeningitis and no abscess.

We believe that the object of multiple trephining—for ascertaining the seat of a deep abscess—can be attained with greater ease and safety by the following procedure:—

3. *The Exploratory Puncture and Aspiration.*—This procedure is not exactly new, but we are not aware that it has ever before been brought into methodical connection with the operation of trephining for the purpose of ascertaining the seat of an abscess. W. Th. Renz published a case in 1867 (Erste Heilung eines traumatischen Gehirnabscesses durch consequente Aspiration des Eiters, ohne vorhergehende Trepanation. Tübingen, 1867), in which a punctured wound from a knife, in the right frontal region, had produced traumatic cerebral abscess. Eleven days after the injury, the wound which had almost healed, was re-opened on account of symptoms of compression. The point of the knife was liberated by means of hammer and chisel, and its extraction was followed by the escape of a considerable quantity of fetid matter. An exacerbation of brain symptoms, accounted for by imperfect evacuation, induced the author, some time subsequent to the operation, fearing that trephining might cause prolapse of the brain, to avoid trephining and evacuate the pus by methodic aspi-

rations with a hypodermic syringe. The aspirations were continued twice a day for six weeks. The pus aspirated gradually grew less in quantity and thinner, till, at last, the syringe only drew a few drops of a yellow, serous fluid. Three weeks of this treatment had effected an entire disappearance of cerebral symptoms. The aspirations were discontinued in the sixth week, and the patient resumed hard, manual labour; however, in only five days, pain, somnolence, vomiting, and slow pulse recurred. Aspirations were resumed for six weeks, and, as in the author's opinion, diffuse leptomeningitis had now become the cause of these symptoms, mercurial inunctions were prescribed. The patient recovered in half a year, perfectly and definitively. Renz recommends the use of a golden needle, with a shaft rounded up to the point, *i. e.*, not cutting, and of a syringe provided with a somewhat complicated mechanism, to do the work of the hand in moving the piston.

Renz published his case fifteen years ago. His mode of aspirating, without trephining, has, as far as we are aware, found no followers in the profession. The reason for this is probably to be sought in the tendency of modern surgery to give free vent to pus wherever met with. Thus Renz's method of curing abscess in the brain by continued, repeated aspirations has shared the fate of the same treatment of abscesses elsewhere. After sufficient trial, aspirations have, on the whole, yielded to free incisions.

J. Whitaker Hulke (case of secondary trephining for traumatic abscess of the brain; recovery. *Med.-Chirg. Trans.*, vol. lxii. 1879) proceeded to ascertain the seat of an abscess through a trephine opening and healthy dura mater in a manner very similar to ours; but he did not develop it systematically. He introduced a fine trocar into the brain to the depth of about an inch, and removed a little green pus with the aspirator. A narrow-bladed knife pushed in along the canula, opened the abscess and three or four ounces of pus escaped. The longitudinal sinus, which had been opened by the knife, was closed by the double means of suture and ligature. After eight months of intercurrent brain symptoms, among them complete blindness, recovery took place; but the blindness persisted.

Footing on the experience of our case, we propose methodical exploratory puncture and aspiration as a means of ascertaining the seat of the abscess through the trephine opening. The ordinary hypodermic needle, an inch or an inch and a half long, is too short. The one we employed was four inches long, its diameter was between one and two mm., and its bore half a mm. The needle may be set in an ordinary hypodermic syringe, but one a little larger, of about three c. cms. capacity, is preferable. This little apparatus is convenient for exploratory aspirations of deep-seated abscess or other accumulations of fluid in any part of the body.

In operating upon the brain it may be well to take Renz's advice, and to use a trocar with a rounded, instead of an ordinary cutting point. Division of small bloodvessels may thereby be avoided. We used a cutting point and without any appreciably bad effects.

As to the manner of executing this exploratory puncture, we offer the following suggestions: A well-disinfected needle is pushed in straight in a certain direction, for about half an inch or an inch; the piston of the syringe is then drawn a little; if no pus follows, the needle is pushed in half an inch or an inch further and the piston again drawn a little, etc. The depth to which it will be permissible finally to push the needle, will, of course, vary with the situation of the trephine opening and the direction of the puncture. In this respect the surgeon will be guided by the anatomy of the brain. The punctures are to be executed at interstices of half an inch or an inch, the utmost care being observed to push the needle in straight and to avoid all lateral movements. If, after a reasonable number of punctures, no pus is drawn, the operator may feel convinced that no abscess is present.

As an abscess is generally about the size of a walnut, and it is seldom smaller, it will necessarily be detected by this procedure. We are convinced that, in a number of cases on record, failure to find the abscess might have been prevented by methodical exploration.

Puncturing of healthy brain substance with a fine, perfectly aseptic needle can do but little mischief. We know from our writers, as well as from our own experience, and we intend to publish a case in point, in connection with another subject, that puncturing of a brain in which no inflammation is present, does not give rise to even the slightest untoward symptoms. But how does the matter stand when the brain is affected with diffuse leptomeningitis or abscess? A needle passing through a focus of inflammatory products and entering healthy tissue, may, undoubtedly, carry bacteria or phlogogeneous substances from the former into the latter. This would, in the worst case, produce encephalitis or secondary abscess. In case of meningitis the life of the patient will, in all probability, terminate, independently of the puncture, before such a consequence has time to develop sufficiently to attract our attention. In case of abscess, our manner of exploring, pushing the needle gently and gradually from the superficial into the deeper parts, can hardly be said to be attended with any great risk of such a result. A third possibility is that the needle may run into a ventricle and draw off some cerebro-spinal fluid. Detmold (*Am. Journ. of Med. Scien.*, 1855, p. 86) opened the lateral ventricle with a knife and evacuated a quantity of pus. His patient died five days afterwards. But opening a ventricle with so coarse an instrument as a knife, and puncturing it with a fine needle, drawing only a few drops of the contained fluid, are proceedings that scarcely admit of comparison. As to this point, however, we must wait to be taught by further experience.

Having ascertained the site of the abscess, the next question is how to open it. This has commonly been done with a knife; but we should avoid the use of cutting instruments, in order to preclude the possibility of hemorrhage. The soft substance of the brain is easily penetrated with a probe or a pair of forceps, or any other sort of blunt instrument, which may be pushed in along the needle as a guide.

The question that still remains to be considered is the advisability of draining cerebral wounds.

4. *Drainage of Brain Abscess.—A priori* reasons do not plead in favour of drainage of the brain with tubes. A drainage-tube is a foreign body, and we know that the presence of a foreign body, even when perfectly aseptic, *e. g.*, a depressed fragment of bone in a case of subcutaneous fracture, penetrating the dura mater and entering the brain tissue, is apt to give rise to general as well as local brain symptoms, although no suppurating inflammation may have set in. But a depressed spicula of bone still connected with the immovable skull and descending into the movable brain-substance, is certainly very unlike a free drainage-tube running into an abscess through a trephine opening. As in most cases in which trephining was performed, the symptoms caused by the irritation of the foreign body disappeared on its removal, the introduction of a new foreign body, in the shape of a drainage-tube, may have seemed a little paradoxical, and this may help to explain the fact that, as far as we have been able to learn, no attempts have been made, with the exception of one, to employ drainage-tubes in the treatment of brain lesions. In the one instance which has come to our knowledge—a case of pistol-bullet wound of the brain related by Burchard—it proved a remarkable success (Burkhardt, *Deut. Zeitsch. für Chir.*, 1881, Bd. 15, S. 582. Ein Beitrag zur Casuistic der Schusswunden des Gehirns mit Einheilen des Projectils). A man of 62 years, attempting to commit suicide, inflicted a gunshot injury upon himself in the right parietal region. The cranium was trephined, but the bullet was not extracted. A drainage-tube was inserted along the track of the projectile, the wound stitched together, and an antiseptic dressing put on. A capsule formed around the bullet, and the wound healed without suppuration. The symptoms in the case were paresis, anæsthesia of the opposite half of the body, and traumatic insanity. The man recovered. Twenty months later he succeeded in committing suicide. The autopsy revealed a band of connective tissue filling the canal of the bullet and running transversely from the parietal bone to the falx cerebri. The greater portion of the bullet was found encapsulated near the latter, and a few bits of lead imbedded in the connective tissue filling the canal.

These two cases, Burchard's and our own, are of course too isolated to prove that cerebral drainage will always turn out as a safe proceeding, but they certainly justify further trial, especially when we consider that, under the old treatment, after successful opening of the abscess, the patients

succumb at the rate of 50 per cent. Moreover, drainage is, at the present day, recognized to be an all-important factor in the treatment of abscesses in general.

Whether it is essential or advisable to wash out an abscess in the brain, after drainage has been established, is a matter of some doubt. Opinions as to the washing out of abscesses in general somewhat diverge, and it need hardly be remarked that an organ as delicate as the brain should be interfered with as little as possible. The majority of surgeons, however, doubtless favour washing out of fetid abscesses wherever else found, and already Rokitansky states (*l. c.* p. 413) "that the thick green pus contained in an abscess of the brain is extremely fetid and phosphorescent." We may entertain a reasonable hope that washing out (*i. e.*, disinfecting) fetid abscesses of the brain will prevent the setting up of œdema or encephalitis in the neighbouring tissues, which secondary diseases are well known to be far more dangerous than the abscess itself. In fact, in the majority of cases, they constitute the final cause of death.

As to the wash employed, we first chose boracic acid, it being of all disinfectants the most harmless; but we were compelled, at least we so believed, to substitute the stronger antiseptic, carbolic acid, and the change was apparently followed by good results.

In conclusion, supported as we are by a single case, we do not wish to recommend any unreasonably bold or hazardous proceedings in so difficult and delicate a matter as the surgical treatment of cerebral abscess. We think, however, that the procedures instituted in the above case strictly conform to the rational methods of modern surgery in treating abscesses in general; and because of this, and not because our patient recovered, we regard the above case as answering in the affirmative the question: Is it probable that abscesses in the brain can be treated advantageously on the same principles as abscesses in other parts of the body?

ARTICLE II.

PERSISTENT OMPHALO-MESENTERIC REMAINS; THEIR IMPORTANCE IN THE CAUSATION OF INTESTINAL DUPLICATION, CYST-FORMATION, AND OBSTRUCTION.

By REGINALD H. FITZ, M.D., Shattuck Professor of Pathological Anatomy in Harvard University.

THE pouch-like formation of intestine occasionally seen projecting from the lower portion of the ileum, is universally known as Meckel's diverticulum. Not that this distinguished anatomist was its discoverer, for early in the eighteenth century Ruysch[1] presents an admirable illustration

[1] Ruysch, Thesaurus Anatomicus, 1701, vii. fig. 283.

of this malformation. Its frequent congenital nature was also recognized before the time of Meckel, and it seems probable that suggestions relative to its origin from the vitelline duct had been presented previous to the publications of this investigator. Morgagni[1] says, while speaking of the diverticulum of the ileum: "I have also seen the same appearance more than once in geese, and particularly in one of such a breadth that it could not be taken for the remains of that duct, which has formerly belonged to the vitellum."

Meckel,[2] however, while recognizing that all the better observers have regarded the diverticulum as a congenital malformation of early occurrence, nevertheless maintains that previous to his efforts "there has been no attempt at explaining in what manner this fault of primitive formation arises." We owe to this author not only the almost universal acceptance of his theory of the origin of the pouch in question, but are also indebted to him for calling conspicuous attention to its importance in the causation of serious disease.

Towards the end of the fourth week of the intrauterine life of the human fœtus, the primitive intestine communicates with the umbilical vesicle by means of a tube, the vitelline or omphalo-mesenteric duct. During the subsequent two weeks the abdominal plates close, shutting in a portion of this duct, which, as a delicate thread, unites to the navel the loop of intestine projecting into the depression at the origin of the umbilical cord. During the subsequent development of the intestine, that portion above the insertion of this thread becomes the greater part of the alimentary canal, while from that below this point the lowermost portion of the ileum and the large intestine are developed. The thread usually disappears. With its persistence and growth, however, there remains, more or less permanently attached to the navel from within, a tube, which presents the structure of the intestine, and which may be found patent in the adult, giving rise to an intestinal fistula opening at the umbilicus. The external free surface of this fistulous tract may project as a bulging tumour, with the appearance and structure of mucous membrane. An abundant new-formation of gland-like tissue may arise from its mucous surface, possessing the characteristics of an adenoma of the intestine. There are certain well-recognized variations in the seat, size, and shape of this appendage to the ileum to which attention may here be called.

Since the diverticulum is present, if at all, in the earliest weeks of fœtal life it is obvious that its position with reference to the ileo-cæcal valve must change with the growth of the intestine. The preponderant elongation of the intestinal tube above the insertion of the duct is accompanied by a less longitudinal growth below this point, and the diverticulum is usually

[1] Morgagni, The Seats and Causes of Diseases; translated by Alexander, 1769, ii. 141.
[2] Meckel, Reil und Autenrieth's Archiv für die Physiologie, 1809, ix. 428.

found in the vicinity of the valve. In the new-born child the distance between the two is about 12 inches, while in the adult the diverticulum is found some 3 feet above the ileo-cæcal valve. The limits within which it may be present are thus differently stated by various authors. Rokitansky[1] finds its seat to be 1 to 2 feet above the cæcum, while Förster[2] extends the limit to upwards of 4 feet. Klebs,[3] among others, has attributed the origin of a large part of the œsophageal diverticula to congenital anomalies. Although other possibilities than the presence of the vitelline duct exist for irregularities of development in this region, the facts which immediately follow show that the possible presence of the duct at the upper part of the alimentary canal must be admitted as a cause of this diverticulum. For the present this view is satisfactorily disposed of by Zenker,[4] but only from the lack of positive evidence. The possibility is still recognized by him that the œsophageal diverticula of pulsion may proceed from congenital formations.

Meckel[5] states that Lobstein and Wrisberg observed a connection of the vitelline duct with the duodenum. Major[6] describes a diverticulum which arose from the jejunum, and which contained valvulæ conniventes for a short distance from its origin. One, 7 inches in length, has been found[7] on the border-line, between the jejunum and the ileum. Fagge[8] refers to a diverticulum, in the museum of Guy's Hospital, which was 54 inches from the cæcum; and to another which arose above the middle of the ileum.

In his comprehensive and valuable paper on intestinal obstruction, Leichtenstern[9] calls attention to the above cases. He says: "The presence of the diverticulum so high up in the intestine, a matter already doubted, is to be understood from the manner of development of the latter. If the growth of the anterior leg of the middle loop is delayed for any reason, the greater part of the small intestine is formed from the posterior or lower leg. In such a case the diverticulum should be found abnormally high."

A similar method of reasoning would permit the development of the diverticulum unusually low down, and it has been suggested by Dr. Symington, in a connection with a case of double cæcum reported by Mr.

[1] Rokitansky, Lehrbuch der Pathologischen Anatomie, 1861, 3te Auflage, iii. 182.

[2] Förster, Handbuch der Pathologischen Anatomie, 1863, 2te Auflage, ii. 97.

[3] Klebs, Handbuch der Pathologischen Anatomie, 1869, i. 163.

[4] Zenker, Ziemssen's Handbuch der Speciellen Pathologie und Therapie, 1877, vii. Anhang, 61.

[5] Meckel, Beiträge zur vergleichenden Anatomie, 1808, i. 93.

[6] Major, The Lancet, 1839–40, i. 362.

[7] Aerztlicher Bericht aus dem k. k. allgemeinen Krankenhause zu Wien, Civil Jahr, 1862, 221.

[8] Fagge, Guy's Hospital Reports, 3d Series, 1869, xiv. 359.

[9] Leichtenstern, Ziemssen's Handbuch der Speciellen Pathologie und Therapie, 1876, vii. 2, 421.

Lockwood,[1] that the malformation in question might be regarded as a diverticulum.

To these differences in the longitudinal position of the diverticulum may be added the striking deviations in the length of the latter. Although this is commonly found to be less than 4 inches, Rokitansky[2] assigns a maximum of 10 inches. Diverticula, as usually understood, of this length are to be regarded as of extreme rarity. Attention has already been called to one of 7 inches, and Haller[3] refers to a statement by Cocchi that he saw a diverticulum 8 inches in length. It is possible that this unusual length is allowed in virtue of the translation of *digitus*, which may be rendered 6 inches or 8 inches. The greatest length recognized by Rokitansky may be exceeded, however, provided it is admitted that duplication of the bowel is due to the persistence of the omphalo-mesenteric duct.

Occasional rare instances of duplication of the intestine are to be met with in medical literature, and are recorded as present at various portions of the intestinal canal.

Meckel[4] refers to the observation by Blasius of a duplication of the œsophagus in an infant five years of age, extending from the first to the sixth rib. The two portions then united and were continued to the stomach as a single tube.

It is stated by Habershon[5] that "in a cyclopean monster, in which the viscera of a double fœtus existed in a single peritoneal cavity, a double œsophagus was found united in a single stomach, with a large convexity extending from side to side, and giving rise to a single duodenum, placed vertically, and receiving the biliary and pancreatic ducts on either side."

The earliest recorded case of duplication of the duodenum occurred in an infant who lived seven days, and is described by Calder[6] as follows:—

"The Stomach was in a good Condition, but the *Pylorus* was very hard, and felt as if it contained some other Substance which appeared on opening this inferior Orifice of the Stomach to be a glandular Piece of solid Flesh, so closely adhering to the *Pylorus* all round, that there was no separating of it, and without the least Perforation in it anywhere; so that the Passage was quite shut up. Below this the *Duodenum* was divided into two; and the Gut continued thus divided to about one-third of an Inch above the *Jejunum*. Into the largest of these Intestinula the biliary Duct opened."

Fairland[7] describes and figures a specimen of duplication of the intestine found in the body of a male infant at full term, who was operated

[1] Lockwood, British Medical Journal, 1882, ii. 574.

[2] Rokitansky, op. cit. 182.

[3] Haller, Elementa Physiologiæ Corporis Humani, 1778, vii. 97.

[4] Meckel, Tabulæ Anatomico-Pathologicæ, 1822. Fasc. iii. 5.

[5] Habershon, Pathological and Practical Observations on Diseases of the Alimentary Canal, etc., 1859, 124.

[6] Calder, Medical Essays and Observations, Revised and Published by a Society in Edinburgh, 1733, i. 205.

[7] Fairland, The British Medical Journal, 1879, i. 851.

upon for imperforate anus. The bifurcation began an inch and a half below the pylorus. The small intestine was one-third of an inch in diameter, and contained semi-solid greenish meconium.

"It was tightly filled with this matter as far as the rudimentary cæcum with its distinct vermiform appendix, from which continued a pipe-like portion of the gut terminating at the cul-de-sac forming the rectum.

"The second portion of the intestine was altogether larger, and more closely resembled a normal bowel; it was about thirteen inches long and one inch in diameter. Before the operation it was distended with fluid, and had been the only portion of the bowel patent since birth. But it terminated in a cul-de-sac and formed, therefore, a species of pouch from which there was no exit except by regurgitation."

It is a noteworthy fact that there are no recorded instances of duplication of the small intestine, with the above exceptions, until the region of the ileo-cæcal valve is reached. This omission is obviously attributable to the description of such malformations as examples of the abnormal insertion of Meckel's diverticulum.

Meckel[1] figures a specimen of duplication of the lowermost end of the ileum, which is described as "divided by a longitudinal septum before the bifurcation," each portion terminating in a cæcal pouch.

The inspection of the drawing suggests, what strangely enough appears to have escaped Meckel's observation, that the specimen was one of vitelline diverticulum with a rudimentary and imperforate colon. The explanation of the probable origin of the longitudinal septum will be evident from what is to follow concerning the lateral insertion of the diverticulum. Meckel refers in the text explanatory of this figure to the observation of a similar case by Boerhaave. He, also, reproduces in the same plate a drawing from Fleischmann, to which he applies the term double cæcum; the single colon terminates in a blind pouch. Reference is also directed to cases of a similar character.

Andral[2] alludes to a case mentioned by Brugnoni, in which two colons sprang from a single cæcum and reunited at the rectum.

Somewhat resembling this is the congenital partial duplication of the colon described by Scheiber.[3] The cæcum and ascending colon were widely dilated and in the normal position. Just above the ileo-cæcal valve, the ascending colon divided into two tubes of unequal width, which, diverging somewhat, eventually became united into a single colon.

Still another specimen of similar nature is described by Lockwood.[4] The case was one of intestinal obstruction in a man 57 years of age. The cæcum lay in the right hypochondrium beneath the liver.

[1] Meckel, Tabulæ Anatomico-Pathologicæ, 1822, iii. 23.

[2] Andral, A Treatise on Pathological Anatomy. Translated by Townsend and West, 1831, ii. 159.

[3] Scheiber, Oesterreichische med. Jarhbücher, Heft 2. Jahresbericht von Virchow und Hirsch, 1875, i. 339.

[4] Lockwood, The British Medical Journal, 1882, ii. 574.

"The ascending colon was double; the two tubes were upon the same plane, the smaller one nearer the vertebral column. Each possessed appendices epiploicæ. The tube which was nearest the spine had a very small canal in its centre, which appeared to have a mucous lining. This canal opened above into the colon by means of a small aperture; below it was lost in a mass of malignant disease. It contained no feces. Its walls were moderately thick. The malignant mass which received the end of the diverticulum also concealed the end of the outer tube, which was the colon proper."

It is of this specimen that Dr. Symington[1] suggested that one of the two tubes might be a diverticulum, there being no proof that they united below.

The view—that most, if not all well-authenticated instances of duplication of the intestinal tract, at any part of its course, are the probable result of the persistence and growth of remains of the vitelline duct—is rendered highly probable from what is known concerning the development of the intestine. The thoracic and abdominal cavities are not differentiated at that period in fœtal life when the vitelline duct is present. The seat of the latter high up or low down in the fœtus would satisfactorily account for the various places of origin of the duplication in question, as it does for those of the diverticulum.

It has already been made apparent that the latter may arise at any point between the pylorus and the cæcum. Whether the duplication or the diverticulum is to result, depends presumably on the existence of conditions favouring or checking the growth of the intestinal walls. The duplication is thus to be regarded merely as an elongated diverticulum, and, like the latter, as will be shown later, may lie within as well as outside the mesentery.

The occurrence of duplication of the œsophagus even may be similarly explained. The evidence is stronger than that offered as explanatory of the origin of the diverticulum of the œsophagus, from the fact that the beginning of the duplication in Blasius's case was lower than the usual seat of the diverticulum. Although in most instances of double intestine the cavities of the tubes are continuous only at their origin, it is obvious that a second communication, lower down, may become established. The manner in which this may take place is suggested by Grawitz[2] in his consideration of a specimen of diverticulum (not of vitelline origin) of the ascending colon. The diverticulum, 8 inches long, consisted of a loop of the colon, the approximated walls of which were fused at the origin, but were separate lower down where the legs were distinct. The fused wall was perforated in two places, while the bend of the loop was closed internally by a septum. Its origin was considered to be fœtal, and the result of an imperforate colon forced into a loop-formation from the pressure of meconium from above. With the occurrence of ulceration and adhesions

[1] See note 4 on page 34.

[2] Grawitz, Virchow's Archiv, 1876, lxviii. 506.

followed by perforation of the fused wall, the intestinal canal might become pervious. This view was favoured by the appropriate presence of cicatricial tissue and deformity. Such a restoration of the intestinal canal could only take place between the fifth month, when meconium is first found in the intestine, and the eighth day after birth, the latter date representing the limit of life in an infant with imperforate intestine.

This interpretation of the origin of a second communication is applicable to all cases of duplication below the stomach, in that part of the intestinal tract where the retention of considerable quantities of meconium is possible. The eventual fusion of the two branches of the œsophagus, as recorded by Blasius, may be similarly explained, from the effects of the retention of food; the time of perforative communication would then take place during some part of the five years of life assigned to the child. The appearance of the drawing reproduced by Meckel and Förster is not in harmony with the inflammatory origin of the inferior communication, but neither of these observers appears to have personally examined the original specimen.

Not only is the difference in the longitudinal position of the diverticulum of importance in connection with its subsequent history, but the fact of its lateral variation should also be borne in mind. All the authorities call attention to its usual origin from the convex border of the intestine. The instances are not a few, however, in which the side of the intestine, even the immediate vicinity of the mesenteric attachment, is the starting-point.

In such cases the diverticulum usually has a well-marked mesentery of its own, which is generally described as sickle-shaped. In the Warren Museum of the Harvard Medical School is a specimen of this nature, of additional interest as presenting a branch of the mesenteric artery of considerable size which lies just below and within the free edge of the mesentery of the diverticulum.

In the collection of the Boston Society for Medical Improvement, now transferred to the Harvard Medical School, is a specimen, No. 1808, described in the catalogue as "fœtal diverticulum." It is a dried specimen, 1½ inch long, arising from the convexity of the intestine, and for two-thirds its length runs parallel with the bowel, and appears to be covered by the same peritoneal envelope. In the same collection is still another, No. 1313, described[1] as follows:—

"Diverticulum: a portion of the intestine of an adult distended and dried. Portion from which the div. arises is largest. Div. is nearly 2 inches in length; about the size of the thumb at origin; tapers to size of tip of little finger, the very extremity again bulges."

The point of interest, at present, lies in the fact that this specimen, like its predecessor, arises free from the mesenteric insertion, and for half its

[1] MS. Catalogue of the Anatomical Museum of the Boston Society for Medical Improvement.

length is firmly attached to the surface of the ileum, being contained within a common peritoneal investment.

Klebs[1] describes a diverticulum, 2 inches long, the half of which lay between the muscular coats of the intestine. It is evident that the case of double cæcum recorded by Meckel[2] belongs in this series.

Roth[3] describes and figures a sausage-shaped diverticulum found in the body of a new-born child. It was 15½ inches above the ileo-cæcal valve, and ran for 4 inches along the convex border of the ileum within the mesentery.

Specimen 732[2] of the Warren Museum is one of intra-mesenteric duplication of the intestine, and is unique in presenting in a striking manner both these features of irregular development of the intestinal tract.

The specimen was presented by Dr. Joseph Stedman, of Jamaica Plain, Mass., and came from a child eight to ten months old. His recollection of the case, after an interval of several years, permits him to state that the child had been previously well, but was suffering from symptoms of intestinal obstruction, which continued for four or five days. The appearance of the specimen is well shown in the accompanying drawing made by Dr. H. P. Quincy:—

Two more or less parallel intestinal tubes, cut transversely across in their continuity, are contained within a single mesentery. The bloodvessels of the latter terminate in the wall of the outermost tube, first supplying branches to the inner tube. The diameter of the outer tube is relatively uniform throughout, while that of the inner, in general somewhat narrower, becomes dilated in the immediate vicinity of an opening through which the canals of the tubes communicate with each other. The contiguous portions of the walls of the two tubes are in close proximity to each other throughout the greater part of their course, and are fused near the common opening.

The walls are composed of mucous, muscular, and peritoneal coats. The mucous membrane of the outer tube shows slightly projecting transverse folds in the vicinity of the opening, while that of the inner tube is relatively smooth. Villi and crypts are present in both.

The opening between the tubes is rounded, sharply defined, one-third of an inch in diameter, and appears to be covered with mucous membrane. The canal of the inner tube is contracted in the immediate vicinity of the opening, and its wall at this part is thickened and fibrous.

Although the most satisfactory explanation of the origin of this specimen is based upon its representing an intra-mesenteric diverticulum, its bifurcated shape, and the seat of the constriction and dilatation require special consideration. Diverticula with knobbed ends are frequently met with, and the rounded ends may have secondary bulgings of their surface. In the Improvement Collection, No. 1033, is a diverticulum with two rounded bulgings at its free end, large enough to suggest an incipient bifurcation.

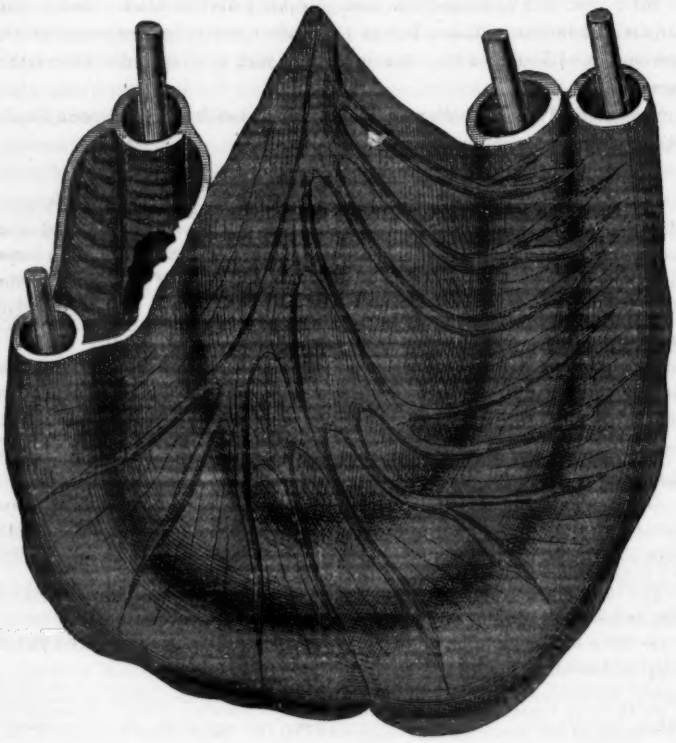
[1] Klebs, op. cit., I. 206.

[2] See note 1, page 34.

[3] Roth, Virchow's Archiv, 1881, lxxxvi. 377.

Hyrtl[1] says that branched diverticula are extremely rare, but he has seen one, an inch in length, coming from a hemicephalic monstrosity, which was divided into five parts.

Fig. 1.



It is difficult to explain the dilated portion of the inner tube, unless it be assumed that a communication existed between this portion of the tube and the intestinal canal nearer the stomach. There are no instances of double true diverticula.

It is, however, conceivable that the inner tube formed a circle either wholly or partially within the mesentery, and ended blindly in the immediate vicinity of its origin after completing the circle. A communication might eventually be established between the blind end and the beginning of the tube by means of a perforative ulceration.

[1] Hyrtl, Handbuch der Topographischen Anatomie, 1860, i. 642.

That the latter process is not unlikely to have taken place is favoured by the presence of the thickened, indurated, and constricted wall at this part of its course.

In the valuable and suggestive article by Roth[1] on the malformations occurring in the region of the omphalo-mesenteric duct, attention is called to the origin of retention-cysts from Meckel's diverticulum. Such cysts are divided into two classes, according as their cavity is continuous or discontinuous with that of the intestine. The wall is composed of the various layers found in the intestine, and the contents are a fluid of various colour and consistency. In both respects the condition is like that occasionally observed in the vermiform appendage.

The occurrence of the first series of cysts is illustrated by the observation of Tiedemann,[2] who found in a fœtus at full term a pedunculate, pear-shaped cyst attached to the convexity of the intestine. It was 14½ lines long, and 7 lines wide. Its cavity communicated with that of the intestine by means of a canal in the pedicle large enough to admit a probe. The contents were a whitish-yellow fluid, containing several flocculi resembling clotted albumen. Roth[3] contributes the description of a like cyst, somewhat larger, occurring in a child one year and four months old. It was connected with the concave surface of the ileum, near the mesenteric insertion, 26 inches above the ileo-cæcal valve. The pedicle having become twisted a hemorrhagic infiltration and necrosis of the mucous membrane had occurred, also acute peritonitis.

These are the only well-authenticated cases of extreme cystic dilatation of the diverticulum known to Roth. Occasional instances of globular forms of diverticula, with more or less constricted necks, are to be met with in medical literature, but none with such extreme constriction as to suggest the application of the term cyst.

Even if the degree of constriction of the neck and the associated distension of the diverticulum present the external appearance of a cyst, the contents are not liquid. Houston,[4] for instance, describes a specimen where the diverticulum formed a circumscribed bag of the size of a turkey's egg, the contents of which were solid, apparently hardened feces.

There can be no question as to the exactness of the term cyst in the second of the series established by Roth where the cavity of the sac is discontinuous with that of the intestine. The earliest observation of this malformation known to him is that described by Raesfeld in 1852, occurring in the body of a new-born child. The cyst was connected with the free surface of the intestine.

The second indisputable observation to be found in print is that pub-

[1] Loc. cit. [2] Tiedemann, Anatomie der Kopflosen Missgeburten, 1813, 66.
[3] Loc. cit., 374.
[4] Houston, Descriptive Catalogue of the Preparations in the Museum of the Royal College of Surgeons in Ireland, 1834, i. 38.

lished by Roth. At the distal end of the intra-mesenteric diverticulum, already[1] referred to, a cyst was seen, the size of a bean, also lying within the mesentery. The contents were a tough, viscid material, and the walls corresponded with that of the intestine. The epithelial lining was composed of cylindrical cells with and without ciliæ. Other cysts, retro-peritoneal and mediastinal, with a wall resembling that of the intestine, were found in the same infant. They were considered as representing lateral deviations from the duodenum and œsophagus, with subsequent detachment, or separated and displaced portions of a diverticulum, or vitelline duct.

Hennig[2] reports the case of an abdominal cyst, in size best comparable to the moderately filled stomach of an adult. It occurred in a new-born child, and filled the anterior portion of the abdomen. The sac measured 8½ inches by 5½ inches by 4 inches, lay within the mesentery, and did not communicate with the intestine. It held 100 grammes of clear, pale red, somewhat viscid, slimy fluid; its walls contained intestinal glands, and was covered with cylindrical epithelium. In suggesting the probable origin of this cyst from a diverticulum, it is considered that a shrinkage of the mesentery of the latter may have taken place, with a consequent traction of the end of the diverticulum towards the root of the mesentery, and eventually between its layers. The communication between the intestine and diverticulum is regarded as subsequently obliterated.

In the Warren Museum, specimen No. 4903 has the following record in the MSS. Catalogue:—

"Diverticulum from the small intestine. The specimen was obtained at the autopsy, from a patient who died of chronic pleurisy. There were no symptoms during life to call attention to its existence. It was given off from the small intestine about 1 metre above the ileo-cæcal valve. It is 3 cm. in length, and about 1 cm. in diameter. There is no apparent communication with the lumen of the intestine."

This specimen is a cyst of the diverticulum, the origin of which is near the mesenteric attachment. Its wall consists of a peritoneal envelope, with loose subperitoneal connective tissue, both continued directly from the intestine. There is a dense middle coat, resembling in appearance the muscular layer of the intestine, although elongated nuclei were not to be made out. Finally, an inner membranous lining, upon the free surface of which occasional club-shaped, stunted villi were found to project. Pouch-shaped depressions, with circular openings upon the free surface, were found scattered throughout this membrane. Epithelium was not present. The middle and internal coats were in the closest proximity to the corresponding layers of the ileum.

Sänger and Klopp[3] describe the presence of five cysts in the abdomen

[1] See note 3, p. 37. [2] Hennig, Centralblatt für Gynäkologie, 1880, iv. 398.
[3] Sänger und Klopp, Archiv für Gynäkologie, 1880, xvi. 415.

of an infant, the largest of the size of a child's head. The structure of the wall of three of these resembled that of the intestine, and they lay behind the duodenum. In the wall of several of these cysts were islets of hepatic tissue. The cysts were regarded as constricted lateral deviations of the fœtal intestine, arising from the duodenal portion in the region where the development of the liver normally takes place. It is a matter of easy inference, however, to regard at least one of these cysts, not containing hepatic tissue in its wall, as of diverticular origin.

The occurrence of simple cysts of possible intestinal origin is not limited to the abdominal cavity.

A cyst in the vicinity of the œsophagus is reported by Wyss.[1] It was of the size of an apple, and was seated on the posterior wall of the œsophagus 1½ inch above the cardia. The contents were a tough mucus in which were cells of ciliated epithelium. The wall contained muscle as well as fibrous tissue. There was no apparent communication between the cavity of the cyst and that of the œsophagus. The origin of this cyst was attributed to the early detachment of fœtal structures, in accordance with the view advanced by Friedreich[2] and Eberth[3] concerning the origin of hepatic cysts with ciliated epithelium from the detachment of bile ducts.

Roth and Hennig[4] report the occurrence of cysts in the vicinity of the œsophagus. In each instance the wall was lined with cylindrical epithelium. In the case reported by Roth the wall had the structure of the intestine, with a predominant development of muscular tissue. The possibility of the origin of these cysts from a diverticulum is to be recognized from what has already been stated with reference to the longitudinal differences in the place of insertion of the vitelline duct. Hennig attributes the origin of the cyst reported by him, which was between the third and fifth cervical vertebræ, to the persistence of a portion of the branchial fissure.

Cysts with a structure resembling that of the intestine are sometimes to be met with in the abdominal wall, in the vicinity of the umbilicus. Their presence in this region suggests at once their origin from a portion of the vitelline duct included within the abdominal wall. The same statement applies to the origin of the adenomata of the navel, described by Küstner.[5] The evidence presented lacks the clinching fact, however, since the reported instances of the cysts and the growths occurred in individuals living at the dates of observation, and there is no evidence to show the relation between the intestine and the posterior surface of the abdominal wall.

[1] Wyss, Virchow's Archiv, 1870, li. 144.
[2] Friedreich, Virchow's Archiv, 1857, xi. 466.
[3] Eberth, Virchow's Archiv, 1866, xxv. 478.
[4] Loc. cit.
[5] Küstner, Virchow's Archiv, 1877, lxix. 286.

Roser[1] reports the case of a male patient, said to have had a tumour in the region of the navel, which had been opened. A slimy, watery discharge from the opening followed the operation, and relief from the fistula was desired. A sound entered a spacious cavity about 6 cm. in diameter. The discharge contained cylindrical epithelium. An incision through the skin disclosed a wall of dense fibrous tissue. When this was cut through there appeared a cavity lined with mucous membrane. As much of the latter as possible was removed, and on examination was found to contain Lieberkühn's glands. Healing, with the formation of a scar, took place after forty-eight days.

A cyst of the abdominal wall an inch above the navel is reported by Wyss.[2] It was of the size of a bean, and lay between the muscle and peritoneum. The contents were an opaque viscid mucus, and its wall, composed of dense fibrous tissue, was lined with ciliated epithelium. If this cyst were of vitelline origin, as its situation suggests, the inclusion is likely to have taken place at an early period of fœtal life.

The presence of ciliated epithelium in the primitive intestine is evident from the investigations of Neumann and Kölliker,[3] and its existence in intestinal cysts has already been mentioned.

The clinical importance of these intestinal cysts obviously depends upon their size and situation. Large abdominal cysts may interfere with the birth of the child, as in Hennig's case, and that reported by Sänger and Klopp. Although the actual cyst or cysts in each instance were not the sole cause of obstructed labour, for an associated ascites was present, they were an important element. In Hennig's case, puncture of the abdominal cavity was necessary before the child could be delivered, and some three liters of a relatively clear fluid escaped. The cyst was not injured.

Sänger and Klopp also report that after prolonged labour vigorous traction of the half-born child was followed by the escape of large quantities of fluid. The birth of the child was then accomplished. It was found that the abdominal walls were ruptured through a portion weakened from deficient closure of the abdominal plates, and that the fluid which had escaped was largely of peritoneal origin. The presence of the cysts, however, was regarded as the chief cause of the enormously distended abdomen.

Even if the child is born, the cyst may remain as a constant source of danger, and, as in the case reported by Roth, may prove fatal by a twisting of its pedicle. The possible effect of an intra-thoracic cyst is shown by this observer, who found evidence of marked pressure upon the lungs

[1] Roser, Archiv für klinische Chirurgie, 1876, xx. 475.

[2] Wyss, loc cit., 143.

[3] Kölliker, Entwickelungs-geschichte des Menschen und der Höheren Thiere, 1879, 853.

and bronchi. The possibility that the cysts of the abdominal wall may become of considerable size is suggested by the history of the urachus-cysts sometimes found between the muscle and peritoneum and extending from the navel to the pubic symphysis.

The vitelline duct is composed not only of layers of tissue equivalent to those forming the coats of the intestine, but it is also accompanied by bloodvessels. These are the omphalo-mesenteric or vitelline arteries and veins which course along its surface and ramify over the walls of the umbilical vesicle. During the atrophy of the vitelline duct these vessels also become atrophied and eventually disappear with the disappearance of the former. But, as will later be shown, the progressive shrinkage and eventual disappearance of the vitelline duct do not necessitate the atrophy of these vessels.

In his description of the several different degrees of the more or less perfect continuance of the primitive connection between the intestine and the umbilical vesicle, Meckel[1] makes the following statement:—

"Sometimes the umbilical vesicle continues beyond the usual time, and communicates with the ileon by an open canal which the omphalo-mesenteric vessels attend.

"Sometimes only a canal exists; it varies in length, and extends from the same point of the ileon to the umbilicus where it opens, and the omphalo-mesenteric vessels also accompany it.

"Finally, sometimes, a greater or less prominence exists in this place, a prolongation termed the diverticulum of the ileon; this is often accompanied by the omphalo-mesenteric vessels which float loosely at its extremity, or which are attached to the umbilicus, or to another region of the intestinal canal, so as to form a plexus."

In his article in Reil's *Archiv*, previously referred to, Meckel[2] states that in the examination of embryos older than ten weeks, he has found intact omphalo-mesenteric vessels in the absence of a diverticulum, and concludes therefrom "that in man as well as in animals the remains of the vitelline canal disappear earlier from the intestine than from the vascular system."

The earliest observation of the existence of the omphalo-mesenteric vessels among the lower animals is to be found in Blasius,[3] whom Schrœder[4] quotes. They were found by him in the dog, cat, and guinea-pig. Von Siebold, who called Schrœder's attention to this observation, also stated that these vessels were very frequently, if not constantly, found in new-born cats and dogs. Schrœder immediately verified this statement by the examination of two new-born puppies and a young guinea-pig.

[1] Meckel, Manual of General, Descriptive, and Pathological Anatomy. Translated from the German into French, with additions and notes, by A. J. L. Jourdan, and G. Breschet. Translated from the French, with notes, by A. Sidney Doane, A.M., M.D., 1832, iii. 289.

[2] Meckel, loc. cit., 444.

[3] Blasius, De Anatomia Animalium, 1681.

[4] Schrœder, Ueber die Divertikel-Bildungen am Darm-Kanale, 1854, 24.

The latest account of the presence of these vessels crossing the abdominal cavity of new-born carnivora as two slender cords is furnished by Allen,[1] as follows:—

"The cords are attached below to the abdominal surface of the umbilicus, and from this they pass forwards and upwards, keeping close together at first, but afterwards separating. The upper end of the one passes into the mesentery of the *ileum* close to its intestinal border; the other passes up to the *meso-duodenum*, and runs into it, close to one of the pancreatic lobes.

"On dissection the posterior cord is found to be connected with the mesenteric artery, the anterior one with the portal vein. I have found the cords in every specimen of new-born cat and dog examined, and frequently in these animals when a week or a fortnight old, and in a few cases at even a greater age. . . . . They can be very distinctly seen in the guinea-pig, up to a week old, probably longer, and here also their connections and course are the same as in the kitten, etc. In the young rabbit there is a somewhat similar arrangement, but in it I have not, up to the present, succeeded in finding after birth more than one cord, and it, like the anterior of the two cords in the guinea-pig, is traceable up to the portal vein.

"That the cords are remains of the *omphalo-mesenteric* system of vessels is shown by their connections, the one which is attached to the mesenteric artery being the obliterated *omphalo-mesenteric* artery, the cord which goes to the *portal* vein being the remains of the omphalo-mesenteric vein. The correctness of this interpretation is proved by the dissection *in situ* of *intra-uterine* specimens of any of these animals, *e. g.* the fœtal guinea-pig, the cords can then be traced out of the body of the fœtus, through the umbilicus and into the umbilical vesicle."

Dr. Allen suggests,[2] in explanation of the persistence of these vessels, that

"An adhesion had formed between the allantois and yolk-sac, and that when this adhesion was great an intercommunication was formed between the vessels of the two sacs, and that this led to the retention of the *omphalo-mesenteric* trunks long after the cessation of the primitive function."

The disappearance of the vitelline duct while the vessels persist is thus explained:—[3]

"The umbilical intestinal loop is drawn into the abdominal cavity as the rest of the alimentary canal grows; this movement, then, on account of the fixed position of the umbilical vesicle outside, causes the vitelline duct to be stretched so that it very probably soon ruptures, and is then speedily absorbed."

In the development of the vascular system of the embryo there are two sets of vessels, arterial and venous, which are connected with the yolk sac. The original function of both obviously ceases with the establishment of the placental circulation. According to Kölliker,[4] the two primitive omphalo-mesenteric arteries which proceed from the aorta to the umbilical vesicle are soon reduced to one. In the fœtus of five weeks, this right artery alone remains. The mesenteric artery arises from this, at first as a small branch, but later becomes the main trunk, with the progressive atrophy of that portion between the intestine and the umbilical vesicle.

[1] Allen, The Journal of Anatomy and Physiology, 1882, xvii. 59.
[2] Loc. cit., 60.
[3] Loc. cit., 61.
[4] Kölliker, op. cit. 919-921.

In like manner two veins are found at the outset, but eventually are reduced to one. This, the left omphalo-mesenteric vein, eventually receives a small mesenteric branch from the intestines. With the disappearance of the peripheral portion and the growth of that nearer the heart, the differentiation into the portal and mesenteric veins becomes established.

Although the occasional persistence of the vitelline vessels was apparent to Meckel and his predecessors, as well as to others like Schrœder, who followed in the consideration of the remains of the omphalo-mesenteric apparatus—renewed attention has been of late years called to this feature.

Hyrtl,[1] in recognition of the fact, refers to an observation by Osiander in 1801, who stated that he found a very fine thread, probably an artery, running from the mesentery to the "side of the peritoneum, where the umbilical artery was lacking."

Ahlfeld[2] showed to the Leipsic Obstetrical Society a preparation from a fœtus, consisting of a delicate vessel filled with blood, which could be followed from the umbilical vesicle through the entire umbilical cord, and across the abdominal cavity to the mesentery.

Ruge[3] reports the discovery, in the body of a new-born child, of a cord, the thickness of a linen thread for 2 ctm. and then of hair-like thinness for $1\frac{1}{2}$ ctm., which ran between the mesentery of the small intestine and the tissue around the right umbilical artery, just before its entrance into the abdominal wall. He further describes the projection of a delicate thread-like process with a knobbed end from the mesentery near the intestine, and a short distance above the cæcum. The statement is then made by him that floating threads with rounded ends may often be found in the mesentery, or near the navel, which are to be attributed to omphalo-mesenteric vessels, or the duct. Immediately after my attention was directed to this point, on examination of the body of a man who died from chronic tuberculosis at the Massachusetts General Hospital, there were found two tuft-like projections from the upper surface of the mesentery, each a half-inch long and about a half-inch apart. They were about two inches distant from that portion of the ileum lying some three feet above the ileo-cæcal valve. The peritoneum covering them was normal in appearance, and the mesentery elsewhere was free from all abnormal changes. The peritoneum in the vicinity of the navel was examined, but with negative results. Since then repeated examinations have been made with reference to what might be regarded as vitelline remains, but with indifferent success.

One of the most remarkable instances of a persistent omphalo-mesenteric vessel must be sought for among the earlier observers. The recent discoveries have been made in the bodies of fœtuses and new-born chil-

[1] Hyrtl, Die Blutgefässe der Menschlichen Nachgeburt, 1870, 6.
[2] Ahlfeld, Archiv für Gynäkologie, 1875, viii. 363.
[3] Ruge, Zeitschrift für Geburtshülfe und Gynäkologie, 1877, i. 7.

dren. Spangenberg,[1] however, found in the body of a young man twenty years of age, what he regarded as an open omphalo-mesenteric vessel.

"It could be followed to within a half inch of the navel, where it became a delicate ligament and was lost in the umbilical ring. It descended from the navel, between the epigastric veins, on the posterior surface of the peritoneum, to which it was united by fibrous tissue, to nearly midway between the umbilicus and pubes. Then, leaving the wall of the abdomen as a thin round cord, and crossing its cavity between the coils of small intestine, it passed beneath the latter towards the spine, rather to the left, and emptied into a bifurcation of the main trunk of the superior mesenteric vein. The vessel was wholly free throughout its entire course, nowhere adhering to the intestine, and was enveloped in a fibrous sheath. It was open to within two inches of the navel, and a small quantity of thin blood from the mesenteric vein was admitted as far as its middle. Its coats for three inches from its origin from the mesentery were collapsed like those of any other vein; but from this point onwards it was of denser structure, and very smooth externally. It had no branches and its texture resembled in all respects that of the umbilical vein; which latter was found open through half its course. The appearance of the navel as seen from without did not vary from that of other normally formed umbilical depressions."

The existence of the omphalo-mesenteric vessels, their relation to the omphalo-mesenteric duct, and their occasional persistence entire or in part were well known to Meckel. Their transformation into fibrous cords was likewise familiar to this author. He says,[2]

"Quite recently I found them in a child of three months arising, as usual, from the superior mesenteric artery and vein, running along the entire length of the diverticulum and converted at its end into a solid thread, several inches long and hanging free."

He refers to similar threads being found by Otto, Sandifort, and Van Doeveren, and adds:—[3]

"In one of the last two cases this thread was adherent to the mesentery, in the other to the colon, thus forming a large loop, which might give rise to the most dangerous results."

This suggestion is evidently based upon a familiarity with the works of Sandifort and Van Doeveren. The former,[4] in his description of an appendix arising from the ileum, states that its end was united to the upper part of the mesentery by a narrow strong thread. He further adds that this formation might have given rise to much disturbance if its infant possessor had lived, especially since a similar band had been found in the bodies of men suffering from ileus. In his catalogue of Van Doeveren's anatomical collection he incorporates the latter's description of a fatal case of intestinal strangulation from a diverticulum and its appendage, probably the first on record. He states[5] that the specimen is one of a sacciform diverticulum, with a blind extremity, from which proceeded an exceedingly tough cord resembling in structure the round ligament of

[1] Spangenberg, Deutsches Archiv für die Physiologie, 1819, v. 88.
[2] Meckel, Archiv für die Physiologie, 1809, ix. 439.
[3] Meckel, Reil's Archiv, op. cit. 441.
[4] Sandifort, Observationes Anatomico-Pathologicæ, 1777, 124.
[5] Sandifort, Museum Anatomicum, 1793, i. Series iii. 121.

the liver. This crossed the large intestine, ascending on the right beyond the ileo-cæcal valve, and became firmly attached to the left side of the cæcum somewhat posteriorly. It served as a noose to constrict the intestine between the diverticulum and the colon, producing most of the symptoms of intestinal obstruction and death within forty-eight hours.

Meckel,[1] in his classification of the causes of internal herniæ, mentions the partial adhesions between parts which should be separated. These may be produced "at the summit of a diverticulum of the ileon, especially by the filament which still exists there, and which is formed by the remnant of the omphalo-mesenteric vessels." This statement is supported by a reference to the above case of Van Doeveren and to another, that of Monroe, which had occurred in the mean time.

That the latter is not an apt illustration will appear from Monroe's account. He gives[2] the drawing of a specimen coming from a patient in whom "a process grew from the ileum, which passed around, and so greatly compressed a portion of the small intestines as to prove the cause of death."

A round cord is figured which unites the above-mentioned process, a diverticulum, to the mesentery; the strangulation, however, was the result of a knot formed by the diverticulum about a loop of intestine.

Conspicuous attention having been called to the importance of Meckel's diverticulum in the production of intestinal obstruction later observers were not slow in adding to the literature of the subject. Eschricht[3] reports a fatal case of strangulation in an old woman, in whom

"The actual diverticulum was about three inches long and a half inch wide at its origin, but became gradually narrowed at its inferior third, and transformed into a solid band about three inches long, which curved backwards towards the mesentery and was inserted not far from the place corresponding with the origin of the diverticulum. . . . .

"The narrower cord entering the mesentery was evidently merely an apparent continuation of the diverticulum, and I was speedily convinced that it could be only an obliterated omphalo-mesenteric vessel, especially in consequence of the place of its insertion. . . . .

"The case is thus one declared as possible by Meckel in his Pathological Anatomy, while describing that reported by Sandifort, where incarceration may occur without the attachment of the diverticulum to the umbilicus, where a congenital loop is formed by the origin of the cord at the mesentery and its insertion at the end of the diverticulum."

A case of marked importance in the recognition of the relation between omphalo-mesenteric remains and strangulation of the intestine is reported by Falk.[4] He found in a man, 20 years of age, a diverticulum, 4½ inches

[1] Meckel, Manual, etc., op. cit. iii. 486.

[2] Monroe, The Morbid Anatomy of the Human Gullet, Stomach, and Intestine, 1811, 538.

[3] Eschricht, Müller's Archiv für Anatomie, Physiologie, und wissenschaftliche Medicin, 1834, 222.

[4] Falk, De Ileo e Diverticulis, Adiecta Morbi Historia, 1835, 18.

long, 2 feet above the ileo-cæcal valve; a solid pseudo-membranous ligament, 1½ inch long, ran from its apex to the abdominal wall, an inch from the umbilicus. A band united the diverticulum and the mesentery, and this appeared to have caused intestinal obstruction.

Falk states that diverticula of themselves are not of much importance in producing functional disturbance of the intestine.

"But where the umbilical vessels are still adherent, and hang off as threads in the abdominal cavity, they may become agglutinated to the organs of the abdomen, and thus cause volvulus."

The relation of the omphalo-mesenteric vessels or their remains to strangulation was well appreciated by Schrœder.[1] He recognizes the occurrence of a band stretching across from the navel to the diverticulum, or to the mesentery in the absence of a diverticulum. In both instances he regards the band as the persistent or obliterated omphalo-mesenteric vessel, and states that

"The insertion in the mesentery is so peculiar, whether it be found in the embryo, infant, or the adult, the observer is obliged to give up the idea of its inflammatory origin, and feels himself almost compelled to recognize the cord as a part of the development of the intestine, particularly as the persistent, more or less completely obsolete, omphalo-mesenteric vessels."

Although recognizing the primitive nature of the cord-like termination of the diverticulum, he accounts for its attachment to other parts of the abdomen than the vicinity of the navel, on the ground of a detachment in intra- or extra-uterine life, and a subsequent adhesion to some part of the peritoneum.

From the time of Schrœder's publication to the appearance of Leichtenstern's article on Intestinal Obstruction in Ziemssen's Cyclopædia, the relation of the omphalo-mesenteric remains to intestinal obstruction became somewhat obscured. Rokitansky[2] asserted that strangulation of the intestine may result when the free end of a diverticulum is adherent, or when the terminal ligament, the obliterated omphalo-mesenteric vessels, becomes adherent to some other part than the umbilicus.

In the consideration of fibrous bands as a cause of intestinal obstruction, Förster[3] says that these are usually the result of peritonitis. The band, however, may be a Meckel's diverticulum adherent to the navel or elsewhere, or a thread representing the remains of the omphalo-mesenteric duct. Klebs[4] treats the matter somewhat more superficially, especially with reference to the nature of the cord which may unite the end of the diverticulum to the navel, mesentery, or cæcum. He admits that the cord, being fastened at both ends, may lead to incarceration of the intestines.

Wilks and Moxon,[5] in speaking of malformation of the intestine, say:—

[1] Schrœder, op. cit., 21 ff.
[2] Rokitansky, op. cit., iii. 182.
[3] Förster, op. cit., ii. 110.
[4] Klebs, op. cit., i. 206.
[5] Wilks and Moxon, Lectures on Pathological Anatomy, 1875, 396.

"The diverticulum may extend through the umbilicus of the fœtus, and so be divided when the cord is cut; it may then be attached or not to the umbilical opening. Under these circumstances a plastic operation may close the bowel, but afterwards strangulation by the band thus formed has been known to occur."

In the consideration of incarceration it is stated[1] that "in some cases this diverticulum appears as a solid cord, representing, as it were, the vessels that once accompanied the vitelline duct, but sometimes such cords are too high for the vitelline duct."

Jones and Sieveking[2] are still less explicit in referring to the relation between the omphalo-mesenteric remains and strangulation of the bowel.

The adherence of the inflamed peritoneal coat of the diverticulum to neighboring organs is spoken of by Birch-Hirschfeld.[3] "In this instance, and also when the diverticulum is connected with the navel by a solid cord, it may be the cause of intestinal strangulation."

In one of the most recent comprehensive works on Pathological Anatomy, that of Ziegler,[4] there is no mention at all of the importance of omphalo-mesenteric remains as a cause of intestinal obstruction. This author speaks of the etiological importance of new-formed membranes, and thread-like adhesions of pathological origin; but leaves it as a matter of pure inference, that the cord, which in rare instances unites Meckel's diverticulum to the umbilicus, is of any importance whatsoever.

This omission is all the more striking as forcible attention has been recently called to the importance of the structures in question in connection with intestinal obstruction.

Leichtenstern,[5] in his monograph, includes a brief consideration of the facts already presented in this paper relative to the persistence of the omphalo-mesenteric remains and their pathological importance as a cause of intestinal strangulation. He refers particularly to the lack of knowledge of the congenital nature of the abdominal ligament so frequently regarded as the result of peritonitis, and emphasizes the various conditions whose importance has attracted so little prominence during the twenty years or more since the publication of Schrœder's paper. Attention is called to the observation of Falk, corroborated by the examination of the specimen from another case, which illustrates the attachment of the ligament at three points, the mesentery, the end of the diverticulum, and the umbilicus. The umbilical portion may become atrophied, while that between the intestine and mesentery persists, thus forming a bridge capable of strangulating the loop of intestine which may pass beneath.

The criticism which naturally occurs in the consideration of Leichten-

[1] Op. cit. 399.

[2] Jones and Sieveking, Manual of Pathological Anatomy. Payne's ed., 1873, 577.

[3] Birch-Hirschfeld, Lehrbuch der Pathologischen Anatomie, 1877, 853.

[4] Ziegler, Lehrbuch der Allgemeinen und Speciellen Pathologischen Anatomie, 2te Auflage, 1883, ii. 1, 315.

[5] Leichtenstern, op. cit., 421.

stern's contribution is that he, also, may attach too much importance to the effects of peritonitis. He states[1] that "the end of the diverticulum is usually free or adherent to the mesentery, the small intestine, cæcum, pelvic organs, and anterior wall of the abdomen along the linea alba, or beneath the navel." Later, while speaking of the possible detachment of the omphalo-mesenteric cord from the navel, he says that:—

"The free end of the cord, under favouring conditions, may again become implanted at various parts of the abdomen, and thus give rise to ligaments, which, proceeding from the ileum, one to three feet above the ileo-cæcal valve, are inserted in the mesentery, the small intestine, or pelvic organs."

When, however, the detachment takes place at the intestinal end the free portion may likewise become implanted, "and thus give rise to cords extending from (or beneath) the umbilicus to various parts of the abdomen."

Although the thought readily arises that, in consequence of inflammatory processes, the diverticulum may become adherent to various parts of the abdomen, there is very little evidence in its favour. The suggestion is obviously based upon the numerous recorded instances, the resemblance borne by the diverticulum to the vermiform process, and the well-known frequency of inflammatory adhesions between the latter and adjacent parts.

The recorded instances are all open to the objection so frequently referred to, that their determination often indicates no familiarity with developmental conditions.

In the Warren Museum, specimen No. 496 of the Improvement Collection has the following record:—[2]

"Strangulation of the intestine by means of a diverticulum, this last arising from the lower end of the ileum, adheres by its blind extremity to the mesentery, and through the ring thus formed a portion of the intestine had passed and become strangulated. The patient died at the Marine Hospital, Chelsea, with all the symptoms of bilious colic, having frequently had similar attacks. Dr. S. D. Townsend."

The following details may be added to the above description: The diverticulum is $3\frac{1}{2}$ inches long, and arises from the convex border of the ileum. It is for the most part flattened, two-thirds of an inch wide at its origin, then tapers gradually, till at its extreme end it becomes dilated sufficiently to admit the tip of the little finger. Beneath the peritoneum at the distal end is a circumscribed quantity of fat tissue as large as a raisin. This end of the diverticulum gives no evidence of a preëxisting peritonitis, but is continued directly to the upper surface of the mesentery by means of a gradually tapering cord, one inch in length, and varying in its width from one-quarter to one-eighth of an inch. The last measurement is present at the junction of the cord with the mesentery an inch and

[1] Loc. cit., 422 ff.

[2] A Descriptive Catalogue of the Anatomical Museum of the Boston Society for Medical Improvement, 1847, 142.

one-eighth from the attachment of the latter to the intestine. The cord is composed of peritoneum, fat tissue, and fibrous tissue, and its continuance upwards toward the root of the mesentery, but wholly within the structure of the latter, is suggested by a circumscribed, broad, linear elevation of the peritoneal envelope of the mesentery. A branch of the mesenteric artery was dissected out from its origin near the root of the mesentery, and was found to lie beneath and cause the linear elevation just described. It then entered the tapering cord, uniting the diverticulum and the mesentery. Its course through the cord to the diverticulum was followed out, and its patency demonstrated by the introduction of a fine probe.

Specimen No. 4831 of the museum collection has the following statement:—[1]

"Diverticulum 4 in. long; arose from ileum, 3 feet above cæcal valve, and adherent at its blind extremity to the mesentery. Through the ring thus formed convolutions of the small intestine had passed and become strangulated; of a claret colour, and adherent slightly to omentum and parietes. There was about a pint of bloody serum in peritoneal cavity. Man, æt. 28, sick 56 hours; attack sudden; pain and tenderness of abdomen and increasing tympanites on second day. Vomited only once after an opium pill. No dejection; bowels free the day before the attack; simple enema the first day, but no cathartic given. Treatment by opiates and stimulants. Symptoms of peritonitis and obstruction in 1877. Dr. Henry J. Barnes."

This diverticulum arises from near the mesenteric attachment, and for the greater part of its length has a diameter of one-half an inch. Its distal end is dilated to the size of an English walnut, and is intimately connected with the mesentery, without evidences of peritonitis, two inches from the intestinal insertion of the latter. The mesenteric peritoneum is apparently continued directly over the diverticulum, at the distal end of which a considerable quantity of subperitoneal fat is present. The mesenteric artery is followed downwards, from near the root of the mesentery, toward the attachment of the diverticulum. A half inch from the latter a branch is given off, readily admitting a capillary bougie for two-thirds of an inch. In dissecting out this artery it was followed directly into the subperitoneal fat of the diverticulum where it became too small to trace further.

The direct passage to the diverticulum of a branch of the mesenteric artery, which, in virtue of its size, position, and relation, is to be regarded as a persistent omphalo-mesenteric artery, thus furnishes positive evidence against the theory of an inflammatory origin of the connection between the diverticulum and the mesentery. Negative evidence is afforded, not only by the customary absence from the diverticulum of the appearances of peritonitis, but also by the comparative immunity of the diverticulum from inflammatory disturbances.

[1] MS. Catalogue.

Among the numerous specimens of diverticula in the Warren Museum, there is but one, No. 2296, which is the seat of a chronic process. Its record is as follows:—

"A portion of intestine inverted, with a diverticulum. The latter is 2½ inches in length, was situated five feet and a half from the cæcal valve, and shows upon its inner surface three large tubercular ulcers."

Dr. Beale[1] records an instance of acute peritonitis following perforation of a diverticulum, in the cavity of which were "a cherry stone, the coriaceous covering of several orange-pips, and two masses of very irregular form and tough consistence, resembling in texture the concretions that are often found in the intestines of horses." Adhesions were present in this case, but the report does not indicate with precision their nature or seat.

An adherent diverticulum is described by Houston,[2] in a manner indicative of the origin. The diverticulum was filled with hard, brittle matter, apparently inspissated feces. The omentum and intestines in the neighbourhood were closely joined to the tumour by adhesions the result of a former inflammatory attack, and the woman had complained for many years before her death of occasional very severe pains in the abdomen.

Mention may also be made of the occurrence of typhoid ulcers in the diverticulum. Dr. Galton[3] describes such a case in which perforation occurred terminating fatally.

These few instances of circumscribed peritonitis of the diverticulum, or causes capable of producing it, with the addition of a rare instance of its adherence to the wall of a hernial sac, are the result of a somewhat extensive research into the literature of the subject. A personal experience of more than thirteen years, in connection with the post-mortem examinations at the Massachusetts General Hospital, does not enable me to recall a single instance of adhesive peritonitis in connection with a diverticulum. Although by no means denying the possibility of the inflammatory adherence to various parts of the abdominal wall or its contents of the end of the diverticulum, or of the obliterated omphalo-mesenteric vessel at its end, such an event must be regarded as extremely rare. On the contrary, it is highly probable that most of the cases reported as adherent diverticula owe their condition to the persistence of open or closed omphalo-mesenteric vessels, continued from the diverticulum as a cord or band. This may unite the diverticulum to the abdominal wall near the navel, to the mesentery, or to the intestine, according to the seat and extent of the atrophy of the vitelline vessels.

[1] Beale, Report of the Proceedings of the Pathological Society of London, 1851-52, 366.

[2] Op. cit. 1. 38.

[3] Galton, Transactions of the Pathological Society of London, 1872, xxiii. 103.

As the frequent existence of inflammatory adhesions between the diverticulum and neighbouring parts may be disputed, so may the inflammatory adherence of persistent or obliterated omphalo-mesenteric vessels be doubted. Leichtenstern deserves credit for redirecting attention to the almost forgotten, exact, and congenital nature of many of the strangulating bands and cords attributed to the remains of a pre-existing peritonitis. At the same time it seems unnecessary to admit to any considerable extent their detachment and subsequent adherence. The absence of evidences of peritonitis, and an appreciation of the possible points of union from variations in the development of these vessels, will remove much obscurity concerning the origin of the apparent adhesions.

The practical importance of bearing in mind the congenital nature of certain of the causes of acute intestinal obstruction cannot be too earnestly insisted upon. Unfortunately the statistics which are available for the determination of the comparative frequency of the various causes of obstruction are necessarily derived from cases whose record is not sufficiently detailed for our present purpose. At the same time they present a relative value, and the figures are interesting if not important. Haven,[1] Duchaussoy,[2] Brinton,[3] and Leichtenstern[4] have already published com-

Acute Intestinal Obstruction.

Approximate relative frequency of the more prominent causes.

	Number of cases included.	Intussusception.	Bands and adhesions.	Twists, knots, and displacements.	Diverticulum.	Vermiform appendix.	Pressure from tumours, abscesses, or organs.	Diaphragmatic hernia.	Mesenteric hernia.	Omental hernia.	Other internal hernia.
		p. c.	p. c.	p. c.	p. c.	p. c.	p. c.	p. c.	p. c.	p. c.	p. c.
Haven . . .	163	39	24	11	6	..	3	5	3	3	6
Duchaussoy . .	347	39	19	6	6	5	6	18			
Brinton . . .	481	54[5]	17	10	7	3	..	..	6[6]	3[7]	
Leichtenstern . .	1134	39	9	6	6	4	4	19	..	5[8]	7[9]

[1] Haven, American Journal of the Medical Sciences, 1855; reprint.

[2] Duchaussoy, Mémoirs de l'Académie Impériale de Médecine, 1860, xxiv. 97.

[3] Brinton, Intestinal Obstruction, 1867, 88. [4] Leichtenstern, op. cit., 528.

[5] Brinton gives 43 per cent. of intussusception in his table of 600 cases of intestinal obstruction by this lesion, bands, adhesions, diverticula, or peritoneum external to the bowel, strictures (including a few tumours) involving the intestinal wall, and torsion of the bowel on its axis. Op. cit. 38.

[6] Ruptured mesentery.

[7] Other peritoneal and omental lesions. [8] Omental incarceration.

[9] This percentage includes cases of mesenteric incarceration and compression, incarceration in abnormal openings of organs, in rings from adhesions, as well as internal herniæ.

prehensive tables of the causes of intestinal obstruction, and an attempt is here made to compare their results. It is obvious that each successive writer has probably included all the cases of his predecessors, although his method of tabulating varies materially. In consequence of this diversity of arrangement, considerable, even wide, differences in the result arise. This is particularly true with reference to the frequency of obstruction from bands and adhesions. It is from this series that it is important to eliminate in the future those which may be due to congenital causes, as obliterated or patent omphalo-mesenteric vessels, and those which are the result of inflammatory conditions, dislocated organs, or pedunculate tumours.

It results, from a comparison of the above statistics, that next in importance to intussusception as the cause of acute intestinal obstructions are bands and adhesions. In a valuable paper published by Fagge,[1] and based upon the examination of the records of 4000 autopsies at Guy's Hospital, from 1854 to 1868, it appears there were 54 cases of intestinal obstruction, the chronic as well as the acute varieties being included. Among these were 7 of intussusception, 6 of volvulus, and 5 each from a diverticulum and from bands. The importance of the bands and adhesions is all the more evident when it is appreciated that in the table above presented this group should include many recorded instances of omental if not mesenteric strangulation, as well as of incarceration in rings from adhesions between organs. It is not intended to suggest that, in most of the cases of obstruction from bands and adhesions, the latter are the result of developmental conditions. It is obvious, however, from what has already been stated, that persistent vitelline vessels, closed or open, may be found as cords or bands between the umbilical region of the anterior abdominal wall and the intestine or mesentery, or both; that they may be connected with these parts near the stomach, as well as at the lower portion of the ileum. Furthermore, a band or cord of similar origin may connect a diverticulum with the intestine or with the mesentery. Finally, the band may be attached at both ends to the mesentery, and yet be of like congenital origin.

In this connection, the figures given by Brinton[2] relative to the insertion of bands are of interest. This author states that "their attachment is generally (75 per cent.) to mesentery or omentum (as 4 to 1) . . . . often (34 per cent.) by one end to the free margin (or some other part) of the bowel . . . Rarely (1 case in 5) are they fixed to the large intestine; and it is still more (thrice as) infrequent for them to unite two points of bowel."

Duchaussoy[3] states, that of 48 cases of strangulation from bands and

[1] Fagge, Guy's Hospital Reports, 3d series, 1869, xiv. 272.
[2] Brinton, op. cit., 69. [3] Op. cit., 318.

adhesions, the right side of the abdomen was the seat in 30 cases; and in most instances between the umbilicus and the right iliac fossa. It is in this part of the abdomen of all others in which the persistent omphalo-mesenteric remains are found, since it is here that the lowermost portion of the ileum is situated. The suggestion is thus readily entertained, that of these cases collected by Duchaussoy, several if not many of the bands were of congenital origin, and the examination of the original articles as well as of his abstracts makes such a suggestion more than justified.

The above consideration seems to warrant the following conclusions:—

1. Bands and cords as a cause of acute intestinal obstruction are second in importance to intussusception alone.

2. Their seat, structure, and relation are such as frequently admit their origin from obliterated or patent omphalo-mesenteric vessels, either alone or in connection with Meckel's diverticulum, and oppose their origin from peritonitis.

3. Recorded cases of intestinal strangulation from Meckel's diverticulum, in most instances at least, belong in the above series.

4. In the region where these congenital causes are most frequently met with, an occasional cause of intestinal strangulation, viz., the vermiform appendage, is also found.

5. It would seem, therefore, that in the operation of abdominal section for the relief of acute intestinal obstruction not due to intussusception and in the absence of local symptoms calling for the preferable exploration of other parts of the abdominal cavity, the lower right quadrant should be selected as the seat of the incision. The vicinity of the navel and the lower three feet of the ileum should then receive the earliest attention. If a band is discovered, it is most likely to be a persistent vitelline duct, *i. e.*, Meckel's diverticulum, or an omphalo-mesenteric vessel either patent or obliterated, or both these structures in continuity. The section of the band may thus necessitate opening the intestinal canal or a blood-vessel of large size. Each of these alternatives is to be guarded against, and the removal of the entire band is to be sought for, lest subsequent adherence prove a fresh source of strangulation.

The chief practical conclusion thus reached in this article is essentially the same as that of Nélaton.[1] This surgeon advised that the incision through the abdominal wall for the relief of intestinal obstruction should be made a little above Poupart's ligament, preferably in the right side. The knuckle of intestine first presenting was to be united to the edges of the wound and incised, an intestinal fistula being thus established. His recommendation was based upon the applicability of this operation, enterotomy, to all cases of intestinal obstruction, since it is usually impossible to make a differential diagnosis of the causes of ileus. The place was selected since

[1] Nélaton, L'Union Médicale, 1857, xi. Nos. 89, 91, 93.

a loop of intestine above the seat of obstruction is likely to be found in this part of the abdomen, and it is also likely to be so far from the stomach that a sufficiency of intestine for digestive purposes will be left intact.

The due appreciation of the relative frequency of congenital causes of intestinal obstruction in the region recommended by Nélaton as the place of operation adds force to his arguments. The operation of enterotomy in the best favoured position is still at hand, provided the above causes of obstruction are not found.

The notes of the following case, kindly given me by Dr. John Homans, of Boston, in whose practice it occurred, illustrate several of the points treated of in this paper.

A man, 21 years of age, met with a severe fall Feb. 8, 1884. He had always been healthy with the exception of a congenital umbilical sinus, which was vaguely supposed to communicate with the intestine. His mother was confident that portions of food (seeds and the like), after being swallowed, had escaped at times from the sinus, and that the latter had been closed since October, 1882. For the past three months he has not been obliged to wear a protecting pad.

Four days after the fall he was seen by Dr. John O. Dow, of Reading, Mass., who found him suffering from absolute intestinal obstruction, tympanites, tenderness, and pain. Three days later, a week after the accident, frequent vomiting of an offensive, so-called fecal, matter took place. Dr. Homans was summoned in consultation after another interval of three days, and found the patient vomiting every few minutes an exceedingly offensive brown fluid. The abdomen was distended, tympanitic, and tender. The eyes were bright, and the countenance intelligent. Pulse feeble, about 130.

A dark-coloured urine was drawn from the bladder, and a director introduced into the sinus. A little fecal matter seemed to escape. The opening was enlarged laterally, especially to the left, sufficiently to admit the finger. The incision may have been an inch and a half long, and the finger entered the peritoneal cavity. No obstruction was felt near the umbilicus within reach of the finger. A loop of intestine was seized, sewn to the skin, and an opening, about a half inch in length, was made through its wall. No fecal or intestinal contents escaped till after the junction was completed, when an offensive, brownish, fluid material and gas were freely discharged.

The patient remained under the care of Dr. Dow, who from time to time reported his condition to Dr. Homans.

On the day following the operation the temperature was 100.4°; the pulse 108. The vomiting had ceased, and there was some relish for food. Occasional twinges of pain in the right groin were complained of. There was but little abdominal distension, and Dr. Dow was able to detect a circumscribed enlargement in the vicinity of the ileo-cæcal valve. Two days later the temperature was normal; pulse 108. The swelling and tenderness in the groin were much diminished, and there were no twinges of pain. Solid food was desired. On the next day, Feb. 22, the temperature was 96.2°; the pulse 120. Restlessness, distress in the back, and ringing in the ears were the prominent symptoms, and were attributed to insufficient nourishment. Injections of beef-tea were given, and were followed by marked relief, the pulse falling to 108, and the tempera-

ture rising to the normal. His strength gradually failed, however, notwithstanding food was given by the mouth and rectum. The temperature became persistently lower, and the pulse weaker with increasing frequency. His death took place Feb. 25, one week after the operation. On the day preceding a passage from the bowels occurred, although Dr. Dow was of the opinion that the contents of the stomach never passed beyond the intestinal fistula.

An autopsy was made twenty-six hours after death by Dr. G. E. Putney, of Reading, who has furnished the following interesting report:—

He found the body considerably emaciated and the abdomen flat. A probe inserted into the congenital opening passed downwards, forwards, and to the right, at an angle of 40° with the median line.

The parietal peritoneum was glistening, of a dark, reddish-slate colour. Its bloodvessels were prominent, especially around the umbilicus, within a radius of four inches. There was no lymph. The small intestine was of a very dark, drab-red colour. The large intestine moderately injected and the colon about two-thirds the normal size. The artificial opening into the intestine was fifty-two inches below the pylorus. Its edges were thickened, ragged, and sloughing, and had failed to unite with those of the abdominal wound.

A diverticulum four inches long and a half inch in diameter arose from the ileum four feet above the ileo-cæcal valve, and extended to the umbilicus. The ileum below its origin was three-fourths of an inch in diameter. The tissues of the diverticulum appeared normal with the exception of the muscular coat of the distal three-fourths of an inch, which was thrice the normal thickness. A tendinous cord the size of a darning needle and four inches long proceeded from the mesentery along the diverticulum, and became lost in the tissue surrounding the umbilical opening. In its course along the diverticulum it appeared as if ensheathed.

The contents of the small intestine resembled a dark pea soup; those of the large intestine were pultaceous, resembling yeast. There was no evidence of an existing constriction at the time of the autopsy.

There seems to be no reasonable doubt that the above case is one of intestinal obstruction from persistent omphalo-mesenteric remains. The band is of exceptional interest as composed throughout of both vascular and intestinal portions, although evidence of patency of the former is not recorded. The autopsy gives no evidence of the manner in which the obstruction occurred, but it is known that a coil of intestine may become looped or knotted over a cord or band. It may also become twisted, and be prevented from unwinding by the pressure of the distended intestine. The operation was effectual in relieving the obstruction, presumably by removing the pressure caused by the distended intestine, and thus permitting the bowel to right itself.

ARTICLE III.

GASTROSTOMY, ŒSOPHAGOSTOMY, INTERNAL ŒSOPHAGOTOMY, COMBINED ŒSOPHAGOTOMY, ŒSOPHAGECTOMY, AND RETROGRADE DIVULSION IN THE TREATMENT OF STRICTURE OF THE ŒSOPHAGUS.[1]

By SAMUEL W. GROSS, A.M., M.D., Professor of the Principles of Surgery and Clinical Surgery in the Jefferson Medical College of Philadelphia.

THE frequency of carcinomatous obstruction of the œsophagus in middle life, and of cicatricial, or fibrous, stricture, particularly in subjects of tender years, to which attention was prominently called by Dr. Henry F. Campbell, at the last meeting of this Association, has led me to collect the somewhat numerous and scattered instances of the various operations which have been practised for their relief, and compare their relative value and disadvantages. To fulfil this object intelligently, carcinomatous and simple strictures will have to be considered separately. In the former, the strength is far more undermined than in the latter, and, as the extension of the disease cannot be arrested, operative interference is only palliative. In simple obstruction, on the other hand, the design is to save as well as to prolong life.

I. CARCINOMATOUS STRICTURE.—The four operations applicable to carcinomatous stricture are gastrostomy, œsophagostomy, internal œsophagotomy, and œsophagectomy, of which the first three are palliative, and the last curative.

1. *Gastrostomy*, or the formation of a permanent fistule in the stomach for the purpose of nutrition, has been resorted to at least 167 times,[2] of

[1] Read before the American Surgical Association, May 1, 1884.

[2] The operators were Albert in 9 cases; Maydl in 7 cases; Howse in 6 cases; Gerster and Sydney Jones each in 5 cases; Golding-Bird and Whitehead each in 4 cases; Bryant, Knie, Kocher, and Schönborn each in 3 cases; Bartleet, Gould, S. W. Gross, Lücke, MacCormac, Marsh, Mason, McGill, Reeves, Rose, Sédillot, Sklifosovski, and Trendelenberg each in 2 cases; and Anders, Anger, Annandale, Berger, Buchanan, Bugantz, Butlin, Callender, Clark, Courvoisier, Croly, Curling, Davies-Colley, Duncan, Durham, Eddowes, Edmunds, Elias, Escher, Fagan, Fenger, Forster, Fowler, Fox, Green, Gritti, Heath, Hjort, Hueter, Hulke, Hume, Jackson, Jacobi, Jacobson, Jessop, Jolly, Kappeler, Kitaevsky, Kraske, Krönlein, Kuester, Langenbeck, Langenbuch, Langton, Lannelongue, Lauenstein, Le Fort, Leisrink, Littlewood, Lowe, Lutz, Mackenzie, Marshall, McCarthy, Menocal, Montgomery, Moore, Morris, Nicholson, F. Page, H. W. Page, Parker, Pepper, Prewitt, Puzey, Pye-Smith, Reid, Richter, Riesel, Rochelt, Rudall, Rupprecht, Schelkly, Greig Smith, Thomas Smith, Stimson, Studsgaard, Stukowenskoff, Svenssen, Swain, Tay, Terrillon, Tilling, Tillmanns, Troup, Volkmann, Von Thaden, Walker, and Zeissl, each in 1 case. A number of these cases have not been recorded in the journals, but have been privately communicated to the author. Great care has been taken to eliminate the names of reporters.

It should be stated that in the two cases of Mason the tonsils were the seat of the disease; that the tonsil and pharynx were affected in one of Whitehead's patients; that the pharynx alone was involved in the case of Parker; and that the pharynx and larynx were carcinomatous in one of Gould's operations. Of these five cases, that of

which 49 perished as the direct or indirect result of the procedure—21 from peritonitis, 11 from pneumonia, bronchitis, and pleurisy, 10 from shock, 4 from phlegmonous gastritis, 2 from uræmia, and 1 from septicæmia. The mortality may, therefore, be placed at 29.34 per cent., which I find is greater by 14.34 per cent. than that of gastrotomy for foreign bodies, only 3 of 20 examples of the latter operation having proved fatal. Two additional cases succumbed, one from hemorrhage from the growth, and the second from suffocation due to perforation of the trachea by the disease, while 66 died of exhaustion, inanition, or extension of the disease, at periods varying from nine hours to one month, 32 having expired within twenty-four hours. In 14 the second step of the operation was not completed. Of the entire number, 117 died in one month; 4 were living, but how long cannot be determined; and 46 survived longer than one month, the average duration of life, after the stomach was opened, having been thirty-three days.

Of the 46 that lived upwards of one month, 28 expired subsequently—2 in five weeks, 2 in seven weeks, 9 in two months, 2 in two months and a half, 3 in three months, 2 in four months, 2 in five months, 1 in six months, 1 in seven months, 1 in seven months and a half, 2 in eight months, and 1 in ten months. Of the remaining 18, 3 were living at the expiration of one month, 2 at forty days, 4 at two months, 2 at three months and a half, 2 at four months, 1 at five months, 1 at six months, 1 at seven months, 1 at twelve months and nine days, and 1 at thirteen months. The last two cases, the most successful on record, were under the charge of Dr. Walter Whitehead of Manchester, who was kind enough to write me that the first could not live much longer, while the second was still enjoying excellent health.

2. *Œsophagostomy*, or the establishment of a permanent fistule in the neck for the introduction of food, has been done by Annandale, Billroth, Kappeler, and Weinlechner, each in 2 cases, and by Evans, Holmer, Holmes, Lavacherie, Menzel, Monod, Podrazki, Poinsot, Reeves, Tarenget, Simon, Studsgaard, and Willett, respectively, in 1 case. Of the 21, 4 recovered, and 17, or 80.95 per cent., perished. Of the latter, however, 5 died of exhaustion, and 12 as the result of the operation—7 from shock, 1 from septicæmia, 1 from pyæmia, 1 from pneumonia, 1 from phlegmon of the anterior mediastinum from the penetration of the periœsophageal tissues by the sound, and 1 from penetration of the posterior mediastinum by the tube. Hence, the mortality may be placed at 57.14 per cent. All of the deaths occurred prior to the nineteenth day after the operation, except that from septicæmia, which was delayed for three months. Of the four survivors, 1 lived two months, 1 three months, 1 five months,

Whitehead was still alive at the expiration of twelve months and nine days, while the remainder proved fatal within ten days—three from exhaustion, and one from peritonitis.

and 1 sixteen months. The average duration of life for all the cases after the operation was forty-six days; but if the case of Tarenget, which lived sixteen months, be excluded on account of uncertainty as to the true nature of the disease, the average life will be reduced to twenty-nine days.

In connection with œsophagostomy, a danger must be referred to which exerted no little influence on the bad results of the operation. In the case of Holmer, the tube employed for feeding had produced ulceration and perforation of the gullet, and gangrene of the retroœsophageal tissues; in one of the cases of Kappeler, the bougie perforated the œsophagus and lighted up phlegmonous inflammation of the anterior mediastinum, and suppuration of the pericardium; in one of Weinlechner's cases, the tube had entered the posterior mediastinum, in which milk was found after death; while in the case of Willett, an abscess had formed in front of the cricoid cartilage from the use of a No. 14 dilating bougie. In another instance, not included in the above statistics, Annandale, after having opened the œsophagus, was obliged to resort to gastrostomy on account of a second impermeable stricture near the cardia.

3. *Internal Œsophagotomy.*—Internal division of a carcinomatous stricture has only been resorted to once, the operator having been Schiltz. The patient survived about six months, when she died of preëxisting tubercle, five distinct operations, supplemented by methodical dilatation, having been required to keep the tube pervious.

4. *Œsophagectomy.*—In 1877, Czerny resected a small portion of the entire calibre of the œsophagus for a carcinomatous ulcer, and united the lower end of the tube to the wound. Five months subsequently, the woman was in so excellent a general condition, and fed herself so comfortably through the opening, that she would not submit to an operation for uniting the divided ends of the canal. Von Bergmann and Novaro, in 1883, removed, respectively, rather more than an inch and a half, and two inches and a half of the gullet, tracheotomy having also been resorted to on account of impending death from suffocation. The patient of Von Bergmann succumbed within twenty-four hours from suppurative mediastinitis, pericarditis, pleuritis, and pneumonia; while that of Novaro was doing well at the expiration of seven weeks. In another case, Billroth removed the œsophagus from the pharynx to the sternum, along with the entire larynx and thyroid gland. The man was fed through an elastic tube for four weeks, when the outer wound closed, and bougies were used to effect dilatation of the passage, which was gradually becoming more and more narrow. Towards the end of the sixth week, the bougie entered the periœsophageal tissues, and death ensued three days subsequently from pericarditis and abscess of the posterior mediastinum. Finally, Israel, in a fifth case, extirpated a circular portion of the œsophagus, but his patient perished on the seventh day from necrotic phlegmon of the neck and pneumonia.

In the treatment of carcinomatous obstruction of the gullet, it is almost universally conceded that dilating bougies are not only harmful from the irritation, inflammation, and increased growth of the tumour which they excite, but that their use, even in skilled hands, is liable to be followed by death from perforation of the canal above the seat of the disease, of which accident not a few examples have been recorded. Hence, dilatation may be disregarded as a remedial agent. Within the past four years there has been a tendency to regard surgical interference as unjustifiable as long as nourishment through an elastic tube can be easily practised. In support of this view, I may refer to the five cases reported by Krishaber, Croft, and Durham, in which life was prolonged, on an average, for one hundred and seventy days, a far better result than has been attained by cutting operations. When it is remembered, however, that nine-tenths of all carcinomata are ulcerated, it will be seen that the cases suitable for permanent catheterism of the œsophagus are comparatively few, on account of the ill effects that are liable to follow the retention of a tube. The œsophagus, moreover, is not always pervious to a tube, its passage being frequently impossible, especially when the lesion is deeply seated, as I myself know from the two examples in which I practised gastrostomy. Hence, the method is not generally applicable, and the surgeon is forced to resort to other means of sustaining life.

Of œsophagectomy, little need be said. If the disease were seated high up, in the vicinity of the cricoid cartilage, and the operation were done soon after its commencement, there would be no objection to attempting it as a curative measure; but as the point mentioned is the one the least frequently affected, and as the disease has generally made considerable progress when the patient is first seen, it is evident that few cases are suitable for the procedure.

Internal œsophagotomy has been done only once, and five operations were required to keep the obstruction open during the six months that the patient survived. Hence, we possess no data upon which to base a positive opinion as to its value: but incision of a carcinomatous obstruction should be condemned on general principles, as it is liable to be followed by ichorous or putrid discharge, hemorrhage, and fungus.

As I have already pointed out, the mortality of œsophagostomy is double that of gastrostomy, the deaths from shock alone being nearly three times as numerous. In addition to the fatality, it does not prolong life as long as opening the stomach, and the patient is exposed to decided risks from the passage of a bougie or tube, which are, for obvious reasons, done away with when the stomach is opened. It is, moreover, open to the objection of affording no information as to the presence of another obstruction farther down, of which occurrence the cases of Annandale and Poinsot are typical examples; and it is, in addition, useless when the

carcinoma occupies the lower half of the gullet, as happens in one-half of all instances.

In five of the twenty-one cases in which it was practised, the opening, instead of being made below the obstruction, was made through the tumour in two, and above it in three. The former afford capital illustrations of the danger of incising the growth, as one perished from septicæmia, and the second died with signs of pyæmia. In one of the cases in which the tube was opened above the obstruction, the sound was forced through its walls, from the effects of which the subject died. Even when it is done below the obstruction, the risks and mortality so much exceed those of gastrostomy that it cannot be preferred to the latter operation.

From the preceding consideration, it follows that gastrostomy has proved to be the simplest, most rational, and safest of the four operations for the relief of carcinomatous stricture. Increasing experience demonstrates that the results are growing better and better, which cannot be said of œsophagostomy; and there is every reason to believe that the successes will become more numerous if it is resorted to as soon as the diagonosis of the disease has been made, and before the powers of the patient are materially impaired. The procedure itself requires no special skill for its performance, and the subsequent treatment may be entrusted to the patient himself. In not a few cases, by affording rest to the parts, the spasm, swelling, and pain disappear, and the subject is enabled to swallow with comparative ease. The few deaths do not constitute an argument against its adoption; while, in the language of Sir Henry Thompson, used in reference to tumours of the bladder, "every recovery is a clear gain; and a fatal issue is simply the natural termination forestalled."

II. CICATRICIAL STRICTURE.—The operations which have been practised for cicatricial stricture are gastrostomy, œsophagostomy, internal œsophagotomy, combined œsophagotomy, and retrograde divulsion.

1. *Gastrostomy.*—The establishment of a gastric fistule has been resorted to 37 times,[1] with 11 deaths as the direct or indirect result of the procedure —7 from peritonitis, 2 from shock, 1 from pyæmia and purulent peritonitis, and 1 from pneumonia, the mortality having been, therefore, 29.72 per cent. One patient died from asphyxia on the fourth day, while drinking water which passed into a cavity in the lung that was due to its penetration by a tube which had been used for feeding, and 8 perished, at periods varying from thirty hours to twenty-eight days, from exhaustion or starvation. Of the entire number, 20 died within one month, and 17 survived

[1] The operators were Bryant, Howse, Maydl, Trendelenburg, and Weinlechner, each in 2 cases; and Albert, Bradley, Davies-Colley, Herff, Forster, Jackson, Jones, Jouon, Langenbuch, Langton, Le Dentu, Lucas-Championnière, Maury, Moeller, Pye-Smith, Rupprecht, Sands, Satzenko, Schattauer, Snegireff, Staton, Studsgaard, Stukovenkoff, Tillaux, Tillmanns, Verneuil, and Von Bergmann.

upwards of one month, the average duration of life after the stomach was opened having been two hundred and ninety-five days, fourteen hours having been the shortest, and fifty-six months the longest, and the patient being still alive.

Of the 17 survivors for upwards of one month, the precise duration of life is unknown in 1; 9 died subsequently, 1 in two months, 1 in five months and a half, 2 in seven months, 1 in ten months, 1 in eighteen months and a half, 1 in thirty-six months, 1 in forty-two months,[1] and 1 in forty-eight months;[2] and 7 were living, respectively, at the end of four months and a half, five months, eight months and a half, ten months, forty months,[3] fifty-three months,[4] and fifty-six months.[5] All of the strictures were due to the accidental or suicidal swallowing of corrosive fluids, with the exception of one following the cicatrization of a diphtheritic ulcer, and three the result of syphilis.

In the case of Davies-Colley, referred to in the foot-note 4, it will be observed that the fistule was closed at the expiration of about eight months, and that the woman was in good health three years and eight months subsequently. In the case of Howse[1] the fistule was also closed at the end of twenty months, and death ensued twenty-two months later from the neglect on her part to have bougies passed, the œsophagus being strictured from half an inch below the cricoid cartilage to within an inch of the cardia. In a third case, which was living at the end of eight months and a half, Von Bergmann succeeded in making the stricture, which was near the cardia, permeable, by means of an instrument, the branches of which acted on the obstruction through the œsophagus and the stomach, when the fistule was closed. At the expiration of five months the condition of the patient was excellent.

2. *Œsophagostomy.*—The formation of a cervical fistule has been attempted by Bryk, Horsey, Nicoladoni, Studsgaard, and Zenker. All of

[1] Case of Mr. Howse, the termination of which is recorded by Dr. Morell Mackenzie in the Amer. Journ. Med. Sciences, April, 1883, p. 436.

[2] Private communication to the author from Dr. Trendelenburg, the operator, who states, in a letter dated Bonn, Dec. 10, 1883, that the boy died four years subsequently from abscess of the brain, the result of scarlatinal caries of the petrous bone. Up to his last illness, he was well nourished.

[3] Mr. Bryant writes me, Nov. 30, 1883, in regard to this case, that "her only failing is being too fat."

[4] Mr. N. Davies-Colley informs me that in this case, which was one of syphilitic stricture, the stomach was opened March 22, 1879. On Dec. 2, when she was able to swallow fluids, the opening was closed on account of the pain and excoriation of the skin produced by the escape of the gastric fluids. About Christmas, 1881, she began to take meat, and since then she had been able to swallow solids well, if she took care to masticate them thoroughly. When last seen in August, 1883, she was well nourished. At no time was a bougie used to dilate the stricture.

[5] Case of Dr. A. Herff, of San Antonio, Texas, who informs me that the girl is well, fleshy, and active, and so well contented as to resist attempts at dilatation of the stricture.

the 5 cases were fatal—1 from pyæmia, in six months, the bougie having produced a deep-seated abscess, 2 from shock, within twenty-four hours, 1 from hemorrhage from the internal jujular vein, and septicæmia, on the eighth day, and 1 from exhaustion, on the sixth day. The average duration of life was, therefore, about forty days. In three of the cases the opening was made above, instead of below the stricture.

3. *Internal Œsophagotomy.*—Division of obstruction from within has been performed by Maisonneuve in 3 cases; by Dolbeau, Elsberg, and Roe each in 2 cases, and by Czerny, Demons, Lannelongue, Mackenzie, Tillaux, Trélat, Sands, Schiltz, and Studsgaard, each in 1 case. Of the 18, 6, or 33.33 per cent., perished within sixteen days—2 from peritonitis, 2 from entire division of the œsophagus, 1 from hemorrhage, and 1 from pleuritis, the result of perforation of the pleural cavity by the œsophagotome. The average duration of life was two hundred and forty-six days. Of the 12 survivors, 3 are noted merely as having recovered, while 9 were alive, respectively, at the expiration of one month, six weeks, nearly three months, three months, five months, eight months, twelve months, fourteen months, and almost seven years. Six cases required more than one operation—two in three, three in one, six in one, and seven in one.

4. *Combined Œsophagotomy.*—In order that he might attack successfully, and with safety, a deep-seated stricture, Ogston, of Aberdeen, opened the gullet by an external incision, as in ordinary œsophagotomy, and divided the stricture on a grooved director. The patient was fed by an elastic tube passed through the nose into the stomach, until the eighth day, when a No. 17 English bougie was employed to dilate the parts. Deglutition soon became easy, but death ensued on the sixteenth day, from hemorrhage from the common carotid artery, which was supposed to have arisen from the chafing of the silver sutures which were used to approximate the edges of the wound.

Gussenbauer successfully performed a similar operation in two cases. In the first, that of a child, a permeable stricture behind the cricoid cartilage, and one just above the cardia, which had been impermeable for several days, were divided on a director with a herniotome, the incision of the latter having been greatly facilitated by stretching the œsophageal mucous membrane. The child was fed through a tube passed through the wound for the first week, and afterwards through the mouth. The external wound closed in thirty-five days, when dilating bougies were employed, so that, at the end of one year, a No. 30 passed easily, and solid food was readily swallowed. In the second case, that of an adult woman, a long stricture, commencing at the cricoid cartilage, was divided; a No. 24 elastic tube was passed through the wound for the purpose of feeding, and retained for five days, after which she was fed through a large tube introduced through the mouth, and the wound had closed in

twenty-four days. She returned in three months, having failed to pass instruments, and the operation was repeated. She was discharged in three months, but returned one year subsequently, with the same degree of contraction, from neglect to keep up dilatation, when the stricture was gradually dilated to twelve millimetres.

Von Bergmann did a similar operation on an adult, the stricture being seated opposite the third ring of the trachea. The patient was fed through a catheter introduced through the mouth; the opening in the neck closed in five weeks; and at the expiration of three months after the operation, the largest-sized bougie could be easily passed.

Finally, Sands quite recently lost a patient, two years of age, from exhaustion in less than forty-eight hours.

5. *Retrograde Divulsion.*—On the 24th of October, 1883, Loreta, of Bologna, in a case of impermeable stricture of the lower third of the œsophagus of a man twenty-four years of age, opened the stomach, passed a divulsor through the cardia into the coarctation, and ruptured the latter to what was regarded to be a sufficient extent to admit of the passage of food, when the wounds in the stomach and belly were closed with sutures. In a second case of a similar nature, occurring a few days later in a woman twenty-six years of age, the same operation was resorted to. At the expiration of three weeks, the condition of both patients was reported to be most satisfactory, but there is no notice in the report of the employment of bougies to keep the strictures open. On the 15th of March, 1884, Loreta did a third operation for a coarctation at the cardia, and the woman was living at the expiration of twenty-five days.

Dilatation, which is regarded by many surgeons as the safest mode of managing cicatricial strictures, is, at the best, merely a palliative remedy. It is frequently not successful, and, under all circumstances, has to be continued as long as the patient lives. The passage of bougies, even in skilled hands, is frequently attended with the worst results. In two cases recorded by Sands, an abscess was caused, of which one proved fatal from perforation of the gullet, and the latter accident happened to Démarquay and Billroth. Mere overstretching, indeed, is likewise dangerous, as in a case reported by Billroth death ensued from mediastinitis and pleuritis. In unskilled hands, the indiscriminate use of bougies has frequently been followed by fatal consequences, and they should only be employed by experienced surgeons. If the coarctation be impermeable, one of the five operations, the results of which have just been given, will, of course, have to be resorted to.

Divulsion through an opening in the stomach would seem to be the only recourse in impassable stricture seated near the cardia of the adult. Sufficient time has not, however, elapsed in the three cases of Loreta to test the value of the procedure, so that it does not demand further consideration.

Combined œsophagotomy for strictures near the cardia is only applicable to children, as the distance from the mouth to the cardia is not more than four inches and three-quarters. Gussenbauer's first case, which has yielded the best results, shows that the operation is a failure with regard to dispensing with the subsequent use of bougies, and his second case also failed, as recontraction ensued after both operations, and he had finally to keep the coarctation patulous with the bougie. Von Bergmann's case may pursue the same course, as it was recorded only three months after the operation. Albert and Sands had to abandon the procedure for gastrostomy from the impossibility of detecting the opening in the stricture. The mortality of the procedure is 40 per cent., and it failed in 28.57 per cent. of all the instances in which it has been attempted. It has, however, succeeded in prolonging life for one hundred and sixty-eight days, on an average, and should not be rejected, as it may prove of value in strictures impassable by instruments introduced through the mouth.

Internal œsophagotomy yields a mortality of 33.33 per cent., and an average duration of life of two hundred and forty-six days, as against a mortality of 29.72 per cent., and an average life of two hundred and ninety-five days for gastrostomy. Hence, it is more frequently fatal than the latter procedure, and less beneficial in its ultimate effects. It, moreover, exposes the subject to certain risks which are not met with in opening the stomach. Thus, of the 18 cases, there was severe hemorrhage in 2, of which 1 proved fatal; in 1 death ensued from penetrating the pleural cavity with the œsophagotome; while in 2 the gullet was completely divided, and the patients succumbed, respectively, from abscess of the periœsophageal tissues and the posterior mediastinum, and pneumonia. In one-third of all cases, the operation had to be repeated, and unless the bougie be passed faithfully and methodically, recontraction will be sure to ensue. It is not adapted to strictures near the cardia, nor to impassable strictures in any portion of the tube. If performed at all, it should be reserved for comparatively recent and short strictures, especially if they be not deeply seated; and it should be remembered that great care, patience, and dexterity will be demanded from the surgeon.

Œsophagostomy is only applicable when the incision can be made below the obstruction, on which account it can rarely be resorted to, even if it be deemed desirable. In 3 of the 5 cases in which it has been done, the opening was made above the stricture, and in 2 others, in which it was attempted by Maydl and Annandale, it had to be abandoned for gastrostomy, on account, respectively, of the density of the coarctation and the presence of a second stricture near the cardia. In addition to these disadvantages, it certainly cannot be claimed that a permanent opening in the neck is preferable to one in the stomach, while the gloomy record of death in every case in which it has been performed offers little encouragement for its repetition.

Gastrostomy is less fatal, and prolongs life longer, than the other operations for cicatricial stricture. Thus, 31 cases of œsophagostomy, internal œsophagotomy, combined œsophagotomy, and retrograde divulsion have afforded 13 deaths, a mortality of 41.93 per cent., and an average prolongation of life of 181 days; while 37 gastrostomies have yielded 11 deaths—a mortality of 29.72 per cent., and an average life of 295 days. In 2, or 10.5 per cent., of the recoveries, the rest given to the parts admitted of the closure of the gastric fistule, while in 1 the fistule was closed after the stricture near the cardia had been rendered permeable through the stomach. Among other advantages, it does not leave an opening in the neck, and it does away with the passage of instruments and the risks of laceration and division of the œsophagus, with the consequent dangers from hemorrhage, emphysema, and periœsophageal, mediastinal, and pleuritic abscesses. In view of all these facts, opening the stomach must be regarded as the best and safest operation for simple stricture of the œsophagus; and it becomes a serious question whether Maydl is not right in advising its immediate performance when caustic fluids have been swallowed. In addition to the shock, the great dangers in these cases are starvation and the irritation produced by the passage of bougies. The opening in the stomach will not only afford us a ready means of allaying the pangs of thirst and hunger, and of preventing the emaciation and exhaustion which are so prominent for the first six weeks, but it will also keep the inflamed parts at rest from the contact of food, and bougies, which only increase the swelling and spasm, through which deglutition is rendered painful and frequently impracticable. More than this, it will avert the danger of perforating the softened coats of the gullet. When the resulting sore begins to heal, bougies can be resorted to with safety, and the gastric fistule can be closed.

Cicatricial Stricture in Children.—The management of cicatricial constriction of the œsophagus of infants and children becomes one of great importance in view of the fact, pointed out by Dr. Campbell at the last meeting of the Association, that cases are frequently met with in subjects of tender years from swallowing solutions of "concentrated lye," which are carelessly left in exposed situations. Of the nineteen cases referred to in the paper, four proved promptly fatal from œdema of the glottis, three were not followed by ill effects, and one had serious trouble; of six not subjected to dilatation, five died at periods varying from five weeks to fifteen months, and the subsequent history was unknown in one; and of five that were dilated, one died of starvation in twenty months, two are merely noted as having recovered, one was well a year subsequently, and one was living nearly six years afterwards, with occasional attacks of choking.

From the great difficulty of managing such cases by dilatation, which

is due partly to the struggles of the subjects, and partly to the disinclination of the parents to distress the child, my own opinion is that the suggestion of Maydl should be enforced, and that dilatation should be resorted to only when the inflammation has subsided, and the denuded surface is in a granulating condition. When the constriction is of some standing, and efforts at dilatation prove fruitless, gastrostomy will prove to be the safest and most beneficial operation for prolonging life.

I have collated 22 operations for cicatricial stricture in children, varying in age from nine months to thirteen years, which demonstrate the truth of this statement. Of 4 œsophagostomies done by Horsey, Nicoladoni, Studsgaard, and Zenker, all died within eight days; of 3 internal œsophagotomies, the cases of Sands and Roe were living, respectively, at the end of three and five months, seven operations having been practised in the first case and six in the second, while the patient of Czerny died from complete division of the tube on the sixteenth day. The case of combined œsophagotomy of Gussenbauer was alive at the end of one year, while that of Sands died within forty-eight hours. Of these 9 cases, 6, or 66.6 per cent., died, and the average duration of life was seventy-one days. Of 13 gastrostomies, in the hands of Albert, Forster, Herff,[1] Howse,[1] Jouon, Langenbuch, Langton, Rupprecht, Sands, Schattauer, Staton,[1] Tillmanns, and Trendelenburg, 5, or 38.46 per cent., died, while the average life was three hundred and thirty-three days, Staton's being alive at the end of five months, Albert's at the expiration of five months and a half, Schattauer's at the end of ten months, and Herff's at the end of fifty-six months. In the case of Schattauer, which was one of two strictures, an obstruction at the cardia was dilated through the stomach, and the patient, a girl of twelve, learned to pass a No. 24 bougie through both coarctations. Of the remaining cases, Howse's perished of general tuberculosis in two months; Rupprecht's, of pulmonary phthisis, in seven months; Langenbuch's, of catarrhal pneumonia, in eight months; and Trendelenburg's, of abscess of the brain, the result of caries of the petrous bone following scarlet fever, in four years.

In the preceding paragraphs I have endeavoured to examine the subject of operative interference in carcinomatous and cicatricial strictures of the œsophagus in a judicial and impartial spirit; and in arriving at the general conclusion that gastrostomy is at once the easiest, safest, and most permanently beneficial of all the procedures that I have mentioned, I desire it to be understood that this opinion is based solely upon the results, and not upon a preconceived favourable opinion.

With the view to render the statistics of œsophagostomy and gastrostomy more complete, it may not be out of place to add that these operations

[1] Private letters from the operators to the author.

have been performed in at least nine additional examples for obstruction of the œsophagus, mainly from extrinsic causes. Thus, œsophagostomy was done twice by Bruns—once for compression by an enlarged thyroid gland, which proved fatal on the tenth day from purulent infection, and once for the same lesion, with the addition of gangrenous periœsophageal abscess, death having ensued from pulmonary phthisis in five weeks; once by Cohen, for syphilitic stenosis of the pharynx, with death in less than twenty-four hours from the penetration of the posterior mediastinum by the tube used for feeding; once by Hadlich, for thickened cricoid cartilage, the patient having survived thirteen months; once by Packard, for carcinoma of the larynx, with death from exhaustion on the fourth day; and once by Watson, for tubercular stricture, the patient having lived two months, when he succumbed from œdema of the glottis. The additional cases of gastrostomy are those of Putzelt and Pinto for compression exerted by enlarged and caseous bronchial glands, of which the former lived fifty-five days, and the latter expired in eight days from passive congestion of the lungs, and that of Cérenville and Dupont for an impassable stricture of a doubtful nature, but which recovered and was being utilized for experiments on digestion.

From the preceding facts we obtain the following results in regard to operative interference for obstruction of the œsophagus from all causes:—

207 gastrostomies have afforded 61 deaths as the result of the procedure, being a mortality of 29.47 per cent., and had prolonged life for 82 days, on an average, at the date of the last reports.

32 œsophagostomies have yielded 19 deaths, a mortality of 59.37 per cent., with a mean life of 52 days.

19 internal œsophagostomies indicate 6 deaths, or a mortality of 31.57 per cent., and an average life of 256 days.

5 combined œsophagotomies have resulted in 2 deaths, a mortality of 40 per cent., and a mean life of 168 days.

5 œsophagectomies have afforded 3 deaths, a mortality of 60 per cent., and an average life of 50 days.

3 retrograde divulsions up to the date of the last reports show a mean life of 22 days, all having been successful.

Hence, 271 examples of operative interference have yielded 91 deaths, or a mortality of 33.58 per cent., and an average prolongation of life of 90 days.

1112 WALNUT STREET, April 30, 1884.

ARTICLE IV.

THEORIES OF COLOUR-PERCEPTION. By SWAN M. BURNETT, M.D., Prof. of Clin. Ophthalmology and Otology in the Univ. of Georgetown; Ophthalmic and Aural Surgeon to the Garfield Memorial Hospital; Surgeon-in-Charge of the Eye and Ear Department of the Central Dispensary and Emergency Hospital, Washington, D. C.

IT is a well-established principle of scientific philosophy, that, in the explanation of natural phenomena, that theory should stand nearest to acceptance which is most in keeping with laws that have been fully demonstrated, or that present some approach to harmony with authenticated facts of an analogous character. That a theory *can* account for phenomena is not a sufficient reason for its unequivocal acceptance; it must account for them in accordance with the laws that have been found to govern all phenomena of like nature.

When the action of such laws is obscure and not clearly understood, and when there are no closely allied facts to fall back on in the construction of a theory, then we are permitted to indulge in speculations, which can be provisionally accepted until other theories, better substantiated by newly discovered facts, arise to take their places; and as the laws controlling any manifestation of nature are not yet, and from the necessity of the case probably never will be, fully understood, no theory concerning any phenomenon can be considered as fixed. The truly scientific mind, therefore, always holds itself in readiness to change its attitude towards any of the workings of nature as our constantly increasing knowledge may demand.

The question of colour-perception is one which opens a very wide field for the display of speculation, and yet the theories on the subject have been, considering this fact, wonderfully few. As we only came on to anything like accurate knowledge concerning the properties of light with Newton, we are justified in regarding the truly scientific ideas concerning the perception of colour as beginning with him.

Theories of Newton and Young.—Since Newton looked upon light as the result of the action on the eye of corpuscles of a material kind emanating from luminous bodies, it was natural for him to suppose that the size of these corpuscles or the velocity with which they travelled, had something to do with the perception of colour, since it was on these qualities of the emitted particles that he accounted for the physical constitution of light, and for its decomposition into the solar spectrum. We accordingly find him adopting the theory that the particles of light excite the retina according to their nature and bigness, and thus give rise to different sensations of colour. His views on the subject may be inferred from the following extract from the fourth edition of his *Opticks* (1730) pp. 318–319.

They are in the form of questions which he appended to Book III. of the third edition, the last which had revision at his hands.

"*Qu.* 12. Do not the rays of light in falling upon the bottom of the eye excite vibrations in the *Tunica Retina*? Which vibrations being propagated along the solid fibres of the optic nerves into the brain, cause the sense of seeing. For because dense bodies conserve their heat[1] for a long time and the densest bodies conserve their heat the longest, the vibrations of their parts are of a lasting nature, and, therefore, may be propagated along solid fibres of uniform dense matter to a great distance, for conveying into the brain the impressions made upon all the organs of sense. For that motion which can continue long in one and the same part of a body, can be propagated a long way from one part to another, supposing the body homogeneal, so that the motion may not be reflected, refracted, interrupted, or disordered by any unevenness of the body.

"*Qu.* 13. Do not several sorts of rays make vibrations of several bignesses, which, according to their bignesses, excite sensations of several colours, much after the manner that the vibration of air, according to their several bignesses excite sensations of several sounds? And particularly do not the most refrangible rays excite the shortest vibrations making a sensation of deep violet, the least refrangible the longest for making a sensation of deep red, and the several intermediate sorts of rays, vibrations of several intermediate bignesses to make sensations of the several intermediate colours?

"*Qu.* 14. May not the harmony and discord of colours arise from the proportions of the vibrations propagated through the fibres of the optic nerves into the brain, as the harmony and discord of sounds arise from the proportions of the vibrations of the air? For some colours if they be viewed together, are agreeable to one another, as those of gold and indigo, and others disagree."

Essentially the same ideas were expressed by the eminent physiologist and physician, Wm. Poterfield, in his *Treatise on the Eye, the Manner and Phenomena of Vision*, in two volumes, Edinburgh, 1759. We find in vol. 2, pp. 342–343, the following paragraph:—

"§ 5. The third manner in which colours may be considered is the passion of our organ of sight, that is, the motions or vibrations excited in the fibres of the retina by the impulse or stroke received from the rays of light; which motions or vibrations being propagated along the solid fibres of the optic nerves into the brain, cause the sensation of colours. For the rays of light being corpuscles of different magnitudes, will, by striking the retina, excite vibrations of different bignesses, which, according to their bignesses must excite sensations of several colours, much after the manner of the vibrations of air, according to their several bignesses excite sensations of several sounds; and particularly the shortest or most refrangible rays will excite the shortest and weakest vibrations for making a sensation of deep violet, the largest or least refrangible, the largest and strongest vibrations for making the sensation of deep red, and the several intermediate sorts of rays, vibrations of several intermediate bignesses to make sensations of the several intermediate prismatic colours; but when the several heterogeneal rays are blended together promiscuously, they must then, in falling upon the *retina*, excite several other different sorts of vibrations for making the sensations of the several compound colours, which will, therefore, differ among themselves according as the light is composed of more or fewer of the different coloured rays or as they are mixed in various proportions."

Accepting the theory of light as promulgated by Newton, nothing could be simpler or more satisfactory than this hypothesis, and it is wrought out in that direct manner characteristic of the great philosopher. No other important explanation of the phenomena of colour-perception, so far

[1] It will be observed that Newton in the discussion of this question recognizes the analogy or identity of light and heat.

as my knowledge extends, was advanced until the overthrow of Newton's emission theory of light and the adoption of the undulatory hypothesis. As is well known, the man who was mainly instrumental in this revolution of opinion was Thomas Young, another of England's great scientific geniuses. He was not content with substituting the undulatory for the emission theory, but deemed it necessary to do away with Newton's simple explanation of coloured vision and put forth one which, in its attempt at simplicity, becomes involved in a series of complexities and inconsistencies which is rarely met with in the history of science. Young believed it impossible for as many vibrations as answered to the chief colours of the spectrum to take place at one and the same point of the retina at one and the same time. This, so far as I am able to learn, was the sole cause for his refusal to accept Newton's theory and for the adoption of the one which is now known by his name and has had an accepted place in the scientific world for eighty years.

Since all the vibrations could not be reproduced at the same point of the retina at the same time, he considered it necessary to reduce the spectrum to a few fundamental colours and make the others but a combination of these. He accordingly fixed upon three colours, which he called primary, and supposed that there existed in the retina three fibres which responded to the vibrations representing them. The three colours he chose as primary were red, green, and violet. White light was the sensation produced by an affection in a certain degree of all three fibres, and the secondary colours came from a combination in varying proportions of two or more of the fundamentals. The ingeniousness of the theory was very captivating, and in one way or another nearly all of the phenomena of coloured vision could be accounted for by it; so that, until within a very few years, it held sway over the scientific mind of the whole world, particularly after it had received the sanction of so eminent an authority as Helmholtz.

Objections to Young's Hypothesis on Physical Grounds.—In the first place, the retina, in addition to its function as a receiving and transmitting organ, is made by this theory into a differentiating apparatus as well. This is rendered necessary because of Young's disbelief in the capacity of the retina to act as a receptacle for vibrations after the manner of simple bodies. There is something remarkable in a kind of hitch we sometimes find in the intellectual workings of even our greatest men. It has always been a wonder to scientists that Newton, with a mental power capable of originating so far-reaching a theory as the law of gravitation, should pass by the undulatory theory of Huygens as not capable of explaining phenomena of light.[1]

[1] The position of Newton in regard to an ether was a peculiar one, and deserves notice here, since it has a bearing on the subject in hand. He by no means denied its

And it is equally astonishing that Young and all those who have accepted his theory should have overlooked one fact which must have been apparent upon a moment's reflection.

Since the emission theory had to go to the wall, it became necessary to search for some origin of the vibrations of the ether, and this was most naturally found in the substance of the luminous body itself. Researches in the domain of molecular physics seem to leave no doubt that when bodies are heated up to the point of luminosity (or when heated at all, for that matter), the ultimate molecules of which they are composed are put into a state of vibration, and it is this vibration which, communicated to the ether, is the first link in the chain of phenomena which finally ends in the sensation of light. It must be accepted as a fact, therefore, that all the vibrations found in the ether must have had their existence primarily in the molecules of the luminous body. When a body is brought to a white heat, for example, the molecules of which it is composed must make all those phases of vibrations which correspond to every colour into which white light may be decomposed, and must make them at one and the same time. In no other way is it possible to explain satisfactorily and consistently the various vibrations of the ether and the manner in which they are brought about.

Now, Young must have known this, for he could hardly have supposed that there were three separate and distinct fibres in all luminous bodies giving out white light, particularly in those bodies which so far as it is possible to ascertain are strictly homogeneous and simple. If this is true of the originating body, why should it not be true of the body receiving and transmitting the vibrations? Why is it necessary to assume the existence of three separate fibres in the retina whose office it is to receive the vibrations,

existence, but on the contrary believed in it strongly, and even went further in the applications of its use than is contended for now. Thus he says in his *Opticks*, p. 328:—

"*Qu.* 23. Is not vision performed chiefly by the vibrations of this medium excited in the bottom of the eye by the rays of light and propagated through the solid, pellucid, and uniform capillamenta of the optick nerves into the place of sensation? And is not hearing performed by the vibrations either of this or some other medium excited in the auditory nerves by the tremors of air and propagated through the pellucid and uniform capillamenta of those nerves into the place of sensation? And so of the other senses.

"*Qu.* 24. Is not animal motion performed by the vibrations of this medium, excited in the brain by the power of the will, and propagated from thence through the solid, pellucid, and uniform capillamenta of the nerves into the muscles for contracting and dilating them? I suppose that the capillamenta of the nerves are each of them solid and uniform, that the vibrating motion of the ethereal medium may be propagated along them from one end to the other uniformly and without interruption; for obstruction in the nerves causes palsies."

It will be seen from this extract that he considered the ethereal medium to pervade solid bodies and to take part in the phenomena of light, but it was a secondary part. The "rays of light" were solid bodies which coming in contact with the ether contained in the retina set it in vibration; which vibration was conveyed along the "solid and pellucid" optic nerve to the brain.

when the body giving rise to these vibrations is simple, and with its molecules so arranged that they can vibrate at one and the same time in the different phases corresponding to the different wave-lengths representing the various colours? This, it seems to me, is a death-blow to the sole objection advanced against the adaptation of Newton's views to the undulatory theory.

Neither is there any support for Young's theory from analogy. Certainly it is not to be found in the sense of hearing which has always been considered as most closely allied to that of vision. On the contrary, it seems the rather to offer evidence against it. Take the membrana tympani, for example. It is a simple membrane, and as far as regards any action of sound-waves homogeneous in structure, and yet it can take up and carry to the chain of small bones, correctly and without any alteration in character, an infinite number of different aerial vibrations at the same time. In an orchestra composed of 100 pieces the trained ear of the leader can often detect a single false note, and yet this is only one of many hundreds of thousands of tones and over-tones which are simultaneously taken up by this small membrane and faithfully transmitted to the ossicles and thence to the auditory nerve. And even when we reach the labyrinth which bears a still closer analogy to the retina in function we find there nothing which would substantiate Young's theory. Even if the organ of Corti were the finally differentiating organ, which no one will, I presume, assert, there is a cord for every tone, and three are not called upon to do the service of hundreds or thousands.

And again, if a fibre is so constructed as to be in harmony with waves of a certain length, it becomes thereby physically incapacitated from responding to waves of other lengths. This is one of the fundamental laws of wave-motion, and its greatest beauty is shown when it comes to be applied in the domain of molecular physics. This law finds no exact application in the theory of Young. He assumes three retinal fibres, red, green, and violet, which are attuned in harmony with the red, green, and violet waves. Now in accordance with this law these fibres should respond only when acted on by wave-lengths corresponding to the colours they represent. If the red fibre is accurately attuned to red rays, it should not be affected by the green or violet, nor the green by the red and violet. Still for a satisfactory explanation of some of the phenomena of coloured vision Young was obliged to suppose that all the fibres were affected by the rays of each of the other two colours, though in varying degrees; and not only that, but they must respond to wave lengths not peculiar to any one of the three. Thus yellow, which is not considered a primary colour, but a combination of red and green, has a distinct wave-length of its own, being about $\frac{1}{47,619}$ of an inch (5,808/10,000,000 mm.). There is no fibre corresponding to this, but for the perception of yellow there must be an affection of the red fibre $\frac{1}{37,037}$ of an inch (7,000/

10,000,000 mm.) wave-length, and the green fibre $\frac{1}{40,000}$ of an inch wave-length (5,271/10,000,000 mm.). So that for the perception of yellow it is necessary for its corresponding wave to affect, not a fibre attuned to its own length, but two others which are adapted to phases of vibration different from its own and different from each other, a state of affairs which the molecular physicist must look upon as absurd. We have, moreover, direct proof that yellow is not a compound colour, for in Hippel's case of unilateral colour-blindness (Gräfe's *Archiv*, xxvi. 3) the yellow as seen by the affected eye had no difference as regards intensity or tone from that seen by the unaffected eye; showing that yellow cannot be composed of red and green, or at least that it can be produced independently. If it were a compound colour, in green-blindness it would appear according to the three-fibre theory as red, in red-blindness as green.

Besides, in giving this amount of forced latitude to his theory, Young destroyed the cause for its existence, since he plainly failed to get rid of the very thing he wished to avoid, namely, the action of a number of wave-lengths on the retina at the same place and at the same time.

The Theory of Prof. Hering.—The theory first advanced by Prof. Hering of Prague[1] differs in many important details from that of Young, though they have this in common, that they require the presence of three peculiar anatomical elements in the retina. In Young's, as we have seen, they are fibres. In Hering's they are chemical substances, which he designates as the *white-black*, the *red-green*, and the *blue-yellow*. Hering supposes that these substances are acted upon by light in a peculiar manner. The red-green substance is affected by no colours but red and green, and these act upon it in opposite ways. Red light, for example, acts in a decomposing or dissimilating (*D*) manner on this substance and produces the sensation of red; green light acts in a regenerating or assimilating (*A*) manner on it causing the sensation of green. Blue has an *A*-action on the blue-yellow substance; yellow a *D*-action. It will be seen that he recognizes four fundamental colours instead of three, which are divided into two pair, the components of each pair being antagonistic; for when the *A*- and *D*-action on any substance are equal the effect is neutral, and no sensation is the result. On the third substance, the black-white, white light acts in a dissimilating manner, while black causes an assimilating action. Moreover, both the other substances are affected in an *A*- and *D*- manner by means of white and black.

The peculiarities of this theory are, that it makes the perception of black a positive action instead of a simple absence of sensation, the so-called complementary colours, antagonistic, and the white resulting from their combination the result of subtraction rather than of addition, as has been heretofore believed.

[1] Lehre von Lichtsinne, Vienna, 1878.

Objections to Hering's Theory on Physical and Physiological Grounds.—This theory has no more basis in fact or analogy than that of Young. The three chemical substances have never been chemically or otherwise demonstrated, nor is this peculiar action of light found represented in any degree in any other function of the animal economy or in the inorganic world. It is not more simple than Young's, and it is open to the same charge of inconsistency. The substances which are supposed to be peculiar to a certain pair of colours are not so, but are likewise acted on by the light peculiar to one of the others. The red-green substance and the blue-yellow substance are both affected, in addition to their own colours, by white and black. Why, it may be very pertinently asked, if we are going to imagine a number of chemical substances, should we limit ourselves to three? We have just as much ground for supposing a half-dozen or more as three. Or, if we are not to have these substances fixed at three, and one substance can respond to the light peculiar to another, why make any division at all? Why not simply take one substance and make it responsive to all the wave-lengths represented by the principal colours of the spectrum? Besides, red and green, and blue and yellow, are not complementary colours —that is, a mixture of the two does not produce white light. Red must be combined with bluish-green, and yellow with ultramarine blue, before we can have white light; and, moreover, the white which is the result of these combinations is not less in intensity than either of the two colours which have produced it, as must be the case if it be the result of subtraction instead of addition, as is contended for by Hering.

Objections to the Theories of Young and Hering from the stand-point of Abnormal Colour-perception.—At the time Helmholtz gave his adherence to the theory of Young, the subject of colour-blindness had not been studied in such detail as it has been within the last eight or ten years; and as by various turnings and twistings it could be made to account for nearly all the phenomena of colour-perception and for many of those of colour-blindness as then understood, the great scientist lent it the weight of his name and authority, and thus made its general acceptance almost inevitable. When, however, Holmgren introduced his method of examining the colour-sense, which made the detection of defects in colour-perception easy, an impetus was given to a more minute study of these abnormalities, and certain facts were brought to light which had to be harmonized with the accepted theory of colour-perception; for it is evident that any acceptable theory of colours must account in a consistent and satisfactory manner not only for all the phenomena of colour-perception, but also for those of colour-blindness.

According to the generally accepted belief among the supporters of the Young-Helmholtz theory, colour-blindness can be of only three kinds (exclusive of total colour-blindness), according as one or the other of the

three fibres is missing or hindered in the proper performance of its function; that is to say, we have red-, green-, or violet-blindness.

Accepting the theory, no other division of abnormal colour-perception is possible; and, moreover, certain facts seemed to lend it support. Now, if the theory were simple and each fibre responded alone to one set of vibrations, the manifestations of abnormal colour-perception would be simple, unmistakable, and consistent; but because the theory is not simple, the phenomena of colour-blindness, according to this theory, become exceedingly involved, and are unravelled with the greatest difficulty. Helmholtz has worked out theoretically the manifestation of abnormal colour-perception for red-blindness as compared with the sensation of the normal eye, as follows: "Spectral red, which feebly excites the perceptive organs of green, and scarcely at all those of violet, must consequently appear to the red-blind *a saturated green of a feeble intensity*, more saturated than normal green, into which a sensible portion of the other primitive colours enters. Feebly luminous red, which affects the perceptive organs of red in the normal eye sufficiently, does not on the other hand sufficiently excite the perceptive organs of green in the red-blind, and it therefore seems to them black. Spectral *yellow* seems to them a *green saturated and intensely luminous*, and as it constitutes the precisely saturated and very intense shade of that colour, it can be understood how the red-blind select the name of that colour, and call all those tints that are, properly speaking, green, *yellow*. *Green* shows, as compared with the preceding colours, a more sensible addition of the other primitive colours; it then appears, consequently, like a more intense but whitish shade of the same colour as yellow and red. The greatest intensity of light in the spectrum, according to Seebeck's observations, does not appear to the red-blind to be in the yellow region, as it does in the normal eye, but rather in the blue-green. In reality, if the excitation of the perceptive organs of green, as it was necessary to assume, is strongest for green, the maximum of the total excitation of the red-blind must be found slightly toward the blue side, because the excitation of the organ perceiving violet is then increased. The white of the red-blind is naturally a combination of their two primitive colours in a determinate proportion, a combination which appears blue-gray to the normal sight; this is why he regards as gray the spectral transition colours from green to blue. Then the other colour of the spectrum, which they call *blue*, preponderates; because indigo-blue, though somewhat whitish, according to their chromatic sense is to them, owing to its intensity, a more evident representative of that colour than of violet" (*Optique Phys.*, p. 393).

In addition to this, one or two other facts are to be noted. If there are only two colours perceived, an equal admixture of them, which will be the sum of all possible colour sensations, should give a sensation of white, and, theoretically, I cannot see why this white, since it is the sum of all the

sensations which the eye is capable of receiving, should not be as intense as the white resulting from the admixture of the three fundamental colours perceived by the normal eye. When a solar spectrum is looked at, the point where the two colours pass over into each other is, according to this theory, gray or neutral (the line N). It should be found in what is the bluish-green to the normal eye close to the blue in the red-blind and close to the green in the green-blind.

So much for theory. How does it stand the test of experiment? Careful and conscientious examinations have been made by several competent individuals of a number of persons suffering from abnormal colour-perception, and we will now proceed to see how far they corroborate the theory as set forth by its most illustrious expounder.

It must be admitted at the outset that a great many difficulties surround a proper examination of abnormal colour-perception, difficulties which no one system of examination has been able to surmount. One of the chief obstacles in the way is the lack of any reliable faculty of comparison in the mind of the person examined. The individual sees clearly and distinctly but two colours in the spectrum, we will say. Now all the colours which the normal eye perceives must be referred by him to one or the other of these two. The only distinction between the colours falling under one or the other head is one of intensity (or it may be some other character which those with normal colour-perception take no note of); and as colours of the same character differ much in intensity and many shades of different colours have the same intensity, the confusions and mistakes likely to arise are almost without number.

Holmgren and many followers of the Young-Helmholtz theory consider that they are able to make a differential diagnosis of the three kinds of colour-blindness by the mistakes that are made in matching colours. There can be no question that this method is most admirably adapted for the detection of abnormal colour-perception, but certainly there is grave doubt as to its being infallible for differential diagnostic purposes.

Prof. Pflüger[1] made an examination of a number of colour-blind by various methods, with the sole object in view of testing their efficiency in this particular. The details of these examinations we have not the space to give, but the subjoined abstracts of the results throw, we think, a flood of light upon the question—or, put it in another form, intensify the darkness which surrounds it—if we are to accept the Young-Helmholtz theory:—

"In the above series of examinations the first six individuals have this in common, that for them there was no shortening in the bright spectrum, and that the maximum of brilliancy lay in the yellow (for Mr. St. in the orange). According to Donders and others, we should have diagnosed green-blindness. The last five have a shortening of the red end of the bright spectrum, and the maximum brightness is moved for them into the yellow-green. According to the same theory, these

[1] Archives of Ophthalmology, vol. ix. p. 435 *et seq.*

five cases must be set down as red-blind. If the shortening of the red end of the spectrum and a certain position of the maximum of brightness are to be used in dividing Daltonians into red-blind and green-blind, it is to be expected that yet other characteristics should be found which would differentiate the one kind of colour-blindness from the other. The above cases, however, show that certain essential qualities belong to representatives of both classes, and, on the other hand, great differences are to be found in the same class. . . . A common characteristic of all the eleven examined is that violet was designated as blue; further, a large number showed a shortening of the left end of the spectrum on diminution of intensity of the light, while to the normal eye there was no such shortening.

"It is interesting to note that a green-blind and a red-blind saw a neutral gray band in the blue-green which the others did not.

"In both classes there were found individuals to whom the spectrum was unqualifiedly dichromic.

"Mr. St. without, and Dr. Z. with a shortened red end of the spectrum distinguished the spectral red, yellow, green, and blue; they not only designated these colors by the right names, but matched them with saturated shades; and when an isolated band of these colours was brought before them there was no confusion in matching them and in the examination with Hirschberg's apparatus the same bands were superposed as identical."

. . . "From this series of examinations it again becomes evident how great are the individual differences in the cases of red-green blindness, and how fruitless the endeavour to unite the numerous varieties of the ordinary class of colour-blindness under two well-characterized subdivisions. The shortening of the red end of the spectrum and the relative brightness in the separate parts can scarcely explain the great difference in the appearance of the spectral colours to the different individuals. The curve of the brightness for the red- and green-blind cannot be typical, because: 1. The shortening of the red end of the spectrum is by no means the same in all the cases; and 2. because the maximum of brightness for each subdivision fluctuates considerably within a certain space.

"Completely green-blind people, Donders says, distinguish in a methodical examination five points in the solar spectrum. Points one and two are the limits of the two ends of the spectrum; three the neutral line *n* which appears gray; and four and five the localities which correspond respectively to yellow and blue. A gray neutral zone was observed in only two cases, once in a red-blind, according to the theory, and once in a green-blind."

Donders says further: "A comparison of the fixed with the movable spectrum shows that for the green-blind the colours on either side of the neutral band remain unaltered. On the other hand, the red-blind often begin, at the junction of the orange and red, in an equal illumination to distinguish a difference in colour, which is seen in the movable spectrum as red and in the stationary one as yellow. I have not been able, as seen from the detailed cases, to verify this law from my own observation."

In speaking of the examination by means of Radde's colour chart, he says:—

"The division into red- and green-blindness based on the shortening of the right end of the spectrum and the relative brightness of the various parts, does not find any corroboration in these observations. On the contrary, they show that the red- and green-blind make the same kind of mistakes, however great the personal variation may be. Here also, as in the examination with the spectral colours, we cannot successfully explain the differences in the condition of the colour-blind, simply by mistaking the intensity of light for colour."

In summing up his conclusions after examination by coloured shadows, he says:—

"This very great individual difference in the reaction of our ten colour-blind to the coloured shadows again proves the great variety in the kinds of colour-blindness and shows also that we are not able as yet to lay down any general laws in regard to the defect and that there is no genuine reason for the division

of the anomaly into red-blindness and green-blindness. Our results negative the theory that every red-green blind must see objective green and red as yellow, while green and blue must be classed with the subjective red called forth by contrast."

In speaking of the results of the examination by the Holmgren test he says:—

"The above observations show in a remarkable manner what has been asserted by many, and especially by Cohn that the results of Holmgren's method militate rather against a division of the colour-blind into red- and green-blind, and also against the theory of Young-Helmholtz, which Holmgren accepts as the basis of his theory. According to Holmgren, A. S., B. S., K., St., W., G. R., and O. R. Sr., are green-blind as well as red-blind. Z. was, according to Holmgren, green-blind, and yet since he had a shortening of the red end of the spectrum he must be red-blind."

In the examination of several colour-blind by more than one method, Magnus[1] found the spectrum dichromic (yellow and blue) both in red and green-blindness, though in red-blindness a few of the individuals said they distinguished more than the two colours; these statements, however, were not definite or satisfactory. Sometimes they would match red with brown wool, and would match a colour they called red with green, and a green with gray or brown.

In *green-blindness* the *lithium* (red) line of the spectrum was matched with various shades of red and yellow, beginning with the most saturated and going to the lightest brick-red approaching to the orange. The *thallium* (green) line was matched with brown, but often with white or gray from brightest to darkest, mixed sometimes with yellow or blue; also with the red from light flesh-colour to dark purplish. The *natrium* (yellow) was often called red, but always matched with yellow.

In *red-blindness* the *lithium* (red) line was nearly always matched with green, but of various shades from the lightest to the darkest, a few times with medium gray or brown. The *thallium* (green) line was matched frequently by green of the same shade as was used in matching the lithium, but often with other shades. The *sodium* (yellow) line was matched occasionally with green, but mostly with yellow.

Mauthner,[2] in the spectral examination of red-green blindness (according to Hering), found the spectrum dichromic, being composed of yellow and blue. The greatest intensity was, as in the normal eye, at the yellow, and there was no gray line between the colours; the line of demarcation was near Frauenhofer's *b*. There was no shortening of the violet end of the spectrum, but of the red end. Spectral red was distinguished, but only up to *B*. The spectrum was matched with only two colours—yellow and blue.

Cohn (*Studien ü. angeb. Farbenblindheit*, 1879) made an examination of one hundred colour-blind by means of all the known methods, and from his general conclusions we select the following:—

[1] Archiv f. Oph., B. xxiv. 4.

[2] Vortrage a. d. Geb. d. Augenhulk, B. i. p. 207.

"15. Visual acuteness does not suffer in the colour-blind."

"21. Yellow and blue were never confounded by the red-green-blind with any other colour."

"47. The brightest portion of the spectrum lay for the most part, in the red-green-blind, in the yellow. In 12 only was it in the yellow-green.

"48. In only two persons was there a shortening of the spectrum, and that was at the red end."

"55. Every red-blind is also green-blind, and every green-blind is red-blind."

In comparing the results of these examinations, made by men of recognized ability and capacity for the work, and conducted solely with the view of arriving at the truth, with the phenomena which the Young-Helmholtz theory, as stated on page 72 *et seq.*, demands, it will be seen at once that they are far from harmonizing. An individual who is red-blind by one method of examination, is pronounced green-blind by another. There is shortening of the red end of the spectrum in the supposed green-blind. There is no gray or neutral line (*n*) in cases where it ought to be found, and when present, is often situated where it should not be. There seems to be but seldom any loss in brilliancy of the spectrum as a whole, and the brightest part is nearly always found in the yellow, as in the normal eye, and there is no sort of regularity in the manner in which the lost colours are matched. The only two colours about which mistakes are not made, are yellow and blue; all other colours are liable to confusion, and in the most unexpected and heterogeneous manner.

The failure of Hering's theory to account consistently for the phenomena of colour-blindness (so called) is equally obvious. In the ordinary form of abnormal colour-perception, there is an inability to properly distinguish shades of red and green. It cannot be denied that these colours are *seen*, and that they are distinguished as *colours*, though not in the same manner as in the normal eye, but *never* as simply black or white. Moreover, when the spectrum is looked at, with few exceptions, these colours are as intense as to the normal eye. How then can Hering's theory explain the phenomena? Red and green make an impression—and an impression as strong, so far as we are capable of judging, as these colours do in a properly colour-perceiving eye. It is impossible, therefore, to suppose, that a substance capable of being acted on by red and green waves is *lacking*. It can only be supposed, under these circumstances, that in the absence of the red-green substance, the yellow-blue substance acts vicariously, and in addition to its own colours, receives also those peculiar to the red-green substance—a fact which strikes at once at the foundation of the theory, and renders it totally inefficient, not to say absurd.

It will be seen, too, that both these theories make the cause of congenital abnormal perception of colours to be resident in the retina. This arises, in part at least, from the fact that they have made the retina a differentiating instead of a receptive and conducting apparatus. This, as we have already pointed out, has no analogy in any other function of the animal economy, except, perhaps, in the case of the ear. But here

the similarity was shown to be more apparent than real. If, as Helmholtz assumes, the organ of Corti has a cord which, by its length and tension, is tuned to every tone which the ear is capable of perceiving, this organ does indeed differentiate as well as transmit vibrations. But here the similarity between the eye and ear ceases, for in the ear the cords respond to vibrations to which they are attuned in accordance with the physical laws of sound, each cord being affected by vibrations of a certain length, and by no others. In the eye, however, each fibre or chemical substance is supposed to answer to all the primary colour vibrations, and to be more easily and readily affected by some than others, and by those, too, which do not bear any relation to each other that is required by the rules of harmony.

But little attention has been given in the discussions of colour-blindness to the part played by the brain in either normal or abnormal colour-perception. The fact that we see with the mind and not with the eye, seems to have been entirely ignored by the partisans in their zeal for one or the other theory. It has been sought to explain all the phenomena of colour-perception, normal as well as abnormal, by means of a normal or abnormal state of the retina, although all must know that no impression can be converted into a sensation except it reach the brain and be properly acted upon by the organ which presides over the function of vision.

Classification of Abnormal Colour-perception.—It is only fair to assume, and the facts in the case amply warrant the conclusion, that an abnormal state of any part of the nervous apparatus of vision—retina, optic nerve, or cerebral centre—would cause some alteration in the normal sensation. Thus we have changes in colour-perception when the retina is affected alone, and when the optic nerve is affected alone. There are likewise states in which we are forced to believe that the fault lies in the cerebral centre. The abnormal colour-perception observed in alcoholism can be much more satisfactorily accounted for by supposing the central organ of vision to be affected than on any other ground, and the phenomena of altered colour-perception manifest in the condition of hypnotism, are clearly cerebral in their character. I am yet at a loss to understand why it is that the brain should have been so persistently overlooked in the explanation of the manifestation of abnormal colour-perception. The name, colour *blindness*, which has been given to the condition, may have had something to do with it. This, of course, is a misnomer, for very few of those thus affected are in reality blind to any colour. The difficulty they labour under is a want of the power to properly distinguish certain shades from certain other shades. It would be absurd to say, because a man could not distinguish certain shades of red and green from each other, that he was blind to either—that he could not see them at all. He does see them, and sees them as colours just as he sees yellow and blue as colours, but he is not able to separate the impression made by the one from that made

by the other. All we know in regard to the differentiation of impressions points to the brain as the place where the final process leading to judgment takes place, and it cannot be denied, that except in rare cases, where there is a shortening of the spectrum, the mistakes of the colour-blind, so called, are errors of judgment.[1]

To refer all kinds of abnormal colour-perception, therefore, to abnormal conditions of the retina would be clearly wrong. They might, however, be properly divided into two general classes, *central* and *peripheral*. In the former the difficulty would lie in the brain, and to it would belong all those cases of congenital origin in which the spectrum is not shortened, and even some of those in which it is. To the latter, the majority of cases acquired through inflammatory or other changes in the retina or optic nerve, and some of the cases probably in which the spectrum appears shortened. To this part of the subject, however, we will refer further on.

A New Theory of Colour-perception.—We think it must now be apparent that none of the theories of colour-perception which have been advanced hitherto can account in a consistent manner for all the phenomena of normal and abnormal coloured-vision, and that, moreover, there are certain objections on physical grounds which, with our present knowledge of the laws of molecular and wave-motion, are insurmountable. Can there, then, be no theory framed which will meet the requirements of the case in the light of recently acquired knowledge? We think there can. In the first place, it is essential to do away with the idea of the retina as a differentiating organ. This, however, will be easy, since there are no physical, anatomical, or physiological grounds for so considering it. The retina should be looked upon simply as a receiving and transmitting structure which shall give up faithfully to the optic nerve the impressions made upon it by the waves of the luminiferous ether. These impressions are carried by the nerve to the brain and are there properly differentiated and converted into sensations. Accepting this view, our task is very much simplified, and we believe that by this means all the phenomena of colour-perception and colour-blindness can be explained in a natural and consistent manner without the necessity of imagining new tissues or novel or unusual reactions of these tissues to light. *We consider the retina to be a substance whose ultimate structure is such as to allow it to respond at one and the same time to a large number of ethereal vibrations; at least such a number as shall be represented by the clearly distinguishable colours of the spectrum.*

This, it will be seen, is going back to the original theory of Newton, and simply adapting the undulatory theory of light to his hypothesis. Instead of the retina being affected by the "nature and bigness" of the

[1] Prof. Mauthner has suggested the terms *erythrochloropia*, or red-green vision, and *xanthokyanopia*, or blue-yellow vision, as substitutes for the names of red-green blindness and blue-yellow blindness. Theoretically, the idea is a good one.

"light corpuscles," we assume it to be affected by the varying number and size of the ethereal undulations. The arguments on theoretical physical grounds (or rather the assumption of such grounds), which had been advanced by Young, we have already attempted to meet in the earlier portion of this paper (page 72). Are there any facts which seem to point in a more positive manner to such ability as we have assigned to the retina? In other words, what is the character of the action of light upon the ultimate structure of substances?

We know that the action of light which we call chemical is exerted on the ultimate particles of a substance by causing an alteration in the relations between the molecules or atoms; and we likewise know, from the experiments of Prof. A. G. Bell, that the electric conductibility which is governed by the molecular structure of a substance is influenced by the action of light. It is on the varying action of light (as regards its *intensity*) on the molecular structure of silenium and other substances that the photophone is constructed. But Prof. Bell has found that this sensitiveness of selenium, for instance, to the action of ethereal waves is not confined to their force, but that the wave-length has also an influence. He has found in his experiments that different coloured lights produce different effects just as different intensities do. If this is true of the inorganic substances, is it not most reasonable to suppose that such an action should find its expression in the same or even a higher degree in a structure so highly organized as the retina? It is a perfectly legitimate supposition that the more delicately constructed the tissue the more sensitive it would be to such actions.

These views of the structure of the retina and the method of light action thereon were set forth in a preliminary paper on the subject of colour-blindness and colour-perception published in the *Archives of Ophthalmology* for March, 1881. They met with favourable notice from several European investigators, among whom was M. Giraud-Teulon, who incorporated them in a paper published in the *Annales d'Oculistique*, January to April, 1882, in answer to and in criticism of an article by Prof. Donders published in the same journal for November–December, 1880, entitled "Remarques sur les couleurs et la cécité des couleurs." In the number for May–June, 1882, of the same journal, Prof. Dunders replies to the strictures of M. Giraud-Teulon, and discusses among other points the method of transmutation or transference of retinal impressions.

"Light may act in two ways, essentially different from each other; it may produce a *chemical* change, and furnish thereby only its equivalent energy; or it may put a molecule in motion, and in this manner give an impulse to a process from which will result an amount of chemical energy entirely *disproportionate to that of the light.*"

As an example of the first kind of energy, he cites the action of light on the green substance of plants; as an example of the second kind, the result of a ray of light on a mixture of chlorine and hydrogen, producing

a force of explosion immeasurably beyond the original power of the light causing it. Donders thinks that the action of light on the retina is analogous to this last, and gives in support of this opinion, among others, the following quotation from M. De War on the currents of electricity produced by the action of light on the retina: "All experiments made up to this time have demonstrated that a quantity of light 100 times greater than another only increases the electric value 3 to 5 times beyond the original."

And in view of these facts Donders makes the following statement:—

"Certes, si le docteur Swan Burnett, cité avec une certaine complaisance par M. Giraud-Teulon, avait dûment distingué entre l'action primaire et secondaire de la lumière, il n'aurait pas proposé une theorie purement physique, qui cherche à illustrer ce qui se passe dans la retine par le rôle du silenium dans le photophone." (p. 207.)

In reply to this stricture of the illustrious savant of Utrecht, it should be said, in the first place, that I have never contended that the action of light on the retina was "purely physical" in the ordinary acceptation of the term. However, it may be that we have not the same understanding of the word "physical." With our present knowledge of the action of the physical forces (heat, light, electricity, etc.) on the ultimate structure of substances, it is clearly impossible to draw the line sharply between "purely chemical" and "purely physical" actions, for even in the purely chemical the result is attained by a physical displacement or alteration in the relation of the atoms. Any difference between the two must, therefore, be one of convention. As, however, the changes which take place in the retina are not permanent, but follow each other in quick succession and pass off with comparative readiness, bearing an analogy in this respect to the vibrations of strings, membranes, etc., I think the term physical would be the more appropriate.

But after all, it matters not, as far as regards the theory, whether the action of light is "primary" or "secondary," so long as each impression is conveyed either in its original form or modified, separately and distinctly, to the brain. Each individual action (as caused by separate wave-lengths) may be diminished or increased in its energy or even changed as to its character, but it still remains distinct from the others, and this is all we contend for or require. Indeed, it does not seem at all improbable that the wave-motion of the ether does undergo a change in the retinal tissue, and that the effect of it is to influence the "nervous conductibility"—to use a very indefinite term—just as the ether waves affect the "electric conductibility" of the silenium in the photophone, but in either case the final result is different for each distinct impression, and in both cases the retina and silenium are receiving and conducting tissues. Therefore, as far as concerns our theory, it is a matter of no special consequence whether we "distinguish between the primary and secondary action of light."

Explanation of the Phenomena of Defects in Colour-perception by the New Theory.—In the first place, it is highly important that the term "colour-blindness" be entirely done away with, except where it can be appropriately applied to those rare cases in which there is absolutely no distinction of colour, all objects appearing as black or white or some shade of gray. For that large mass of cases in which there is only confusion of colours clearly distinguished by the ordinary eye, the term "abnormal colour-perception," we think, would be more appropriate. The name is comprehensive, describes the condition with sufficient accuracy, and has no special theory lying back of it. The phenomena of abnormal colour-perception will require different explanations according as they fall under the heads of "central" or "peripheral," as mentioned in a preceding section. The "central" forms, having their seat at the cerebral centre of vision, and being mere errors of judgment, must be explained on the general principles of sense-perception. In such cases we need not suppose the retina to be in an abnormal condition at all. The state of its molecular structure may be physically and physiologically perfect, and it may take up with the greatest faithfulness all the separate vibrations of the ether falling in it and transmit them, by means of the optic nerve, to the cerebral centre, and yet this centre may not be able to properly separate the different phases of vibrations received.

It must be remembered that the majority of those having defective colour-sense see the spectrum dichromic, the dividing line being about the beginning of the blue. We will assume in such cases (though the principle is applicable to all), that the cerebral centre is not able to differentiate clearly between the vibrations corresponding to those colours which lie on either side of the line, and which the normal eye can readily separate. I do not mean to say that in all cases the red, green, and yellow waves make precisely the same impression on the cerebral atoms. I believe they do not, but in the judgment of the individual they are, on account of his obtunded colour-sensibility, so nearly alike that he is *likely* to confound them, though as a matter of fact he does not always do so in all their shades. When there is a shortening of the spectrum it does not follow by any means that the fault lies in the retina. It may mean that the vibrations corresponding to the missing part of the spectrum fail to excite the cerebral molecules. There is a restricted range of visual sensation.

As before mentioned, we think this form of defective colour-perception could very properly be called *central*, and under it can be classed the large majority of the cases of abnormal colour-sense. It must not be forgotten that the sense of colour is after all the result of a process of education, by which the individual is enabled to separate varying impressions into distinct sensations, and in defective colour-perception we can and do have all grades of incapacity. Holmgren found it im-

possible to make any clear and distinct line of separation between what he called "colour-blindness" and a "diminished chromatic sense," that is, between those who confused the colours, which were clearly distinguishable by the ordinary eye, and those who could not distinguish between the finer shades of the same or allied colours. It is utterly impossible to account satisfactorily for such phenomena on any other basis than defective judgment. We therefore look upon so-called "colour-blindness" as but an exaggerated condition of "diminished chromatic sense."

The "peripheral" forms of defective colour-sense would depend upon an inability of the retina to take up certain vibrations, or of the optic nerve to carry them. It is a perfectly justifiable supposition that the retina responds to some ether-waves much more readily than to others, and that the optic nerve fibres carry certain wave motions more easily than others; that they seem to be unaffected by the ultra-red or ultra-violet rays is sufficient proof of this. Any alteration in the molecular structure of either (inflammation, partial atrophy, etc.) would, therefore, very likely affect their receptivity and conductibility, or there might be a congenital defect in the molecular structure of these bodies which would lead to the same result. The defects in colour-perception, therefore, attendant upon clearly marked changes in the optic nerve and retina, we would class distinctly under "peripheral," while some cases of congenital defect are probably of the same nature.

Support of the New Theory from Biology and Embryology.—In our explanation of colour-perception we have assumed that the sense of colour is but a very highly developed sense of temperature.[1] That is, that the optic nervous apparatus is but a very highly organized nerve of common sensation, and that both are affected by that form of radiant energy we know as ethereal vibration, and that the only difference between the two consists in the fact that in the process of evolution the nerves concerned in vision have become more and more adapted to the alterations produced in their molecular structure by the *quality* of the vibrations as expressed in their different wave-lengths. It now remains to show how far this opinion has its basis in the facts of biology and embryology.

On this subject we can quote no higher authority than that of the lamented F. M. Balfour, whose early death is little less than a calamity to science. In his *Comparative Embryology*, 1881, vol. ii. p. 387, he says:—

"In the lowest forms of animal life the whole surface is sensitive to light, and organs of vision have no doubt arisen in the first instance from limited areas becoming especially sensitive to light in conjunction with a deposit of pigment. Lens-like structures formed either as a thickening of the cuticle or as a mass of cells were subsequently formed; but their function was not in the first instance to throw an image of external objects on the perceptive part of the eye, but to concentrate the light upon it. From such a simple form of visual organ it is easy to pass by a series of steps to an eye capable of true vision."

[1] Preyer, Archiv f. d. ges. Phys. xxv. 1881, has gone into this question in great detail.

And again :—

"It seems probable that the percipient elements of the retina are formed in all cases from the epidermis."

All our knowledge of embryology tends to substantiate the supposition that the optic nerve is but a highly specialized nerve of common sensation, and the retina a modification of the integument in which the nerve terminates.

Mr. G. J. Romanes has made a number of elaborate and careful experiments upon the *medusæ*, an account of which will be found in the *Fortnightly Review*, 1878, p. 522 *et seq.* He found that the marginal surface of the bell is susceptible of stimulation, by light of any kind or variety, leading to a contraction of the body.

"Probably," he says, "we have here the most rudimentary type of a visual organ that is possible; for it is evident that if the ganglionic matter were a little more stable than it is, it would either altogether fail to be thrown down by the luminous vibrations or would occupy so long a time in the process that the visual sense would be of no use to its possessor."

The time taken for the stimulus of light to be followed by contraction was about one second.

We quote the following passages from Mr. Herbert Spencer's *Principles of Biology*, vol. ii.

"That eyes are essentially dermal structures seems scarcely conceivable. Yet an examination of their rudimentary types and of their genesis in creatures that have them well developed, shows us that they really arise from successive modifications of the double layer composing the integument. They make their first appearance among the simpler animals as specks of pigment covered by portions of epidermis slightly convex and a little more transparent than that around it. Here their fundamental community of structure with the skin is easy to trace; and the formation of them by differentiation of it presents no difficulty." (p. 303.)

. . . "In a rudimentary eye we have but a slight peripheral expansion of a nerve to take cognizance of the impression; and to concentrate the impression upon it there is nothing beyond a thickening of the epidermis into a lens shape. But the developed eye shows us a termination of the nerve greatly expanded and divided to receive the external stimulus. It shows us an introverted portion of the integument containing the apparatus by which the external stimulus is conveyed to the recipient nerve. The structure developed in this sac not only conveys the stimulus, but also, like its homologue, controls it; and in the one case as in the other the structure which does this is an epidermic growth from the bottom of the sac." (p. 306.)

"Possibly, too, the light itself to which the tissues of some inferior animals are everywhere sensitive, may aid in setting up certain of the modifications by which the nervous parts of the visual organs are formed, producing, as it must, the most powerful effects at those points on the surfaces which the movements of the animal expose to the greatest and most frequent contrasts of light and shade; and propagating from these points currents of molecular change through the organism." (p. 307.)

To those who accept the evolution theory, these facts must seem conclusive. Even before the development of an eye proper there appear to be molecular changes wrought in the nerves of common sensation by the different wave-lengths which are sufficient to cause separate sensations.

In the further advance in evolution, therefore, it does not seem necessary to assume a total change in the character of the wave-action on the nervous substance, but only an increase in the delicacy of its action and its specialization in certain parts of the surface; those grosser ether waves which belong to the domain we call heat affecting all but an inconsiderable portion of the superficies, the finer which fall in the domain of light affecting that portion restricted to the organs concerned in vision.

The Part of the Retina concerned in Colour-perception.—It will not be inappropriate in a paper like this to offer some suggestions as to the part of the retina concerned in the reception of the vibrations which are afterwards perceived by the brain as colours. For a long time the layer of rods and cones has been accepted as a "percipient layer" of the retina. Professor J. W. Draper, of New York (*Physiology*, 1856), advanced the idea that it was the layer of hexagonal pigment cells which were acted on in a chemical manner by light, and that the sense of vision was the result of this chemical action, transferred to the brain by means of the optic nerve. That the vibrations do not affect the layer of rods and cones exclusively, as commonly accepted, seems proved by the fact, reported by Stricker (referred to in Hirschberg's *Centralbl.*, July and August, 1883), that in a tiger, which during life had good visual power, there was found after death a complete absence of this layer. The same condition was likewise found in a leopard's eyes. That the pigment layer is not essential is shown by the power of vision remaining in albinos, and in the lack of a scotoma in certain cases of coloboma of the choroid.

In the theory we have been considering, it is a matter of indifference what layer of the retina principally receives and takes up the ether vibrations, and then gives them over to the optic nerve fibres.

It is well known that the parts of the retina at the macula lutea are more sensitive than the more peripheral portions, and, carrying out Mr. Spencer's idea, it may be with perfect fairness supposed that these must in time have become much more delicate in their responsive molecular movements than those peripheral parts which are less concerned in direct vision.

As bearing upon the part the retina plays in the reception of vibrations and the adaptability of its structure to different wave-lengths, it may be well to take note of what I call the "residual sensations" of white light, but which are commonly spoken of as "after-images." More than ten years ago, when I first became skeptical as regards the adequacy of the Young-Helmholtz theory, I began to make experiments in this direction with the hope that the results might lead me into the way of finding a true theory of colours.

My object was to find through what phases of colour the after-image of white light would pass, from which I might be able to judge as to the relative power of the different waves to affect the retina. Simple as the

experiment may appear at first sight, its proper and satisfactory performance is not devoid of difficulty and complications.

The plan I finally fell upon was to place a bit of white paper on black ground in the clear sunlight, and expose my retina to it for a certain length of time and watch the changes of the after-image when the eye was closed and covered with the hands, so as to exclude all light. The character of the residual sensation varies within certain limits, with the time of exposure. I have not space to give all these experiments in detail, or even to give a general summary of the modification of the results by various circumstances. I must limit myself to the inference—which could hardly be called a law until it shall have been corroborated by other experimenters—I have been able to draw from those experiments which have been conducted under the most favourable circumstances and were freest from sources of error.

When the retina is exposed for from one to three or four seconds, according to the intensity of the light, the first coloured after-image is light violet or blue, which, if the light has not been intense, fades away either gradually to nothing or to a dirty yellow. If the exposure is longer, then other colours follow, and the order I have found, when the circumstances were most favourable, are light blue, deep rich blue or purple, reddish-purple, muddy yellow, reddish-orange, dark green, light red, dark red, black. I do not mean to say that in all of my experiments, which amounted to hundreds, this exact number of after-images occurred, but they always followed this order when they were observed. Thus red of any tint was never first observed, nor did green come before yellow or orange when they were both observed in the same experiment; moreover, except the blue and purple, few of the colours could be called pure (except occasionally the red), though exceptionally some of the others under certain circumstances would come out with startling distinctness.

The phases of colour of the after-images of white light, as given by Helmholtz (*Optique Physiologique*, p. 489), are greenish-blue, indigo, violet or rose, greenish-orange. When the light has acted for a longer time he then had white, blue, green, red, and blue on a black ground; on a white ground, white, green, and blue.

At the time I made my own first experiments I was not in a position to know those given by Aubert in his *Physiologie der Netzhaut* (1865), p. 372, and referred to in his *Physiologische Optik* (Gräfe u. Saemische, Handb. d. gesammt. Augenheilk, B. II. S. 559). After a momentary glance at the sun (which of course gives us the purest white light to be had), he found the order of the after-images to be light blue, light green, red. It appears that Fechner had observed the same order in his investigations (Poggend, Ann. 1840).

In the *Nineteenth Century* for October, 1883, Mr. Sidney Hodges gives the results of his experiments on these after-images, studying them in a

somewhat different way. He found, for instance, that the after-image of white light after ten seconds' exposure was blue, after fifteen seconds green, after twenty-five seconds yellowish-green or pure yellow. In the disappearance of these after-images (whether blue, green, or yellow), they always followed the same order: First, a dull orange, pink, deep pink, crimson, violet, blue. The length of time from the first perception of the after-image to its commencement to disappear varied with the length of the exposure. It is apparent, however, that Mr. Hodges has not been accustomed to making such experiments, and his results, for this reason, lose very much of their value.

There are certain discrepancies in this series of experiments by different observers which I cannot at present account for, but any one who has investigated at all in this field will at once appreciate the difficulty of obtaining uniform results under all circumstances, even after we shall have excluded the "personal equation." It must be remembered that we can never be sure when we have the retina in a state of perfect quietude. The movements of the lids, and of the balls, and even the intra-ocular circulation set up vibration in the retina, which always tends to complicate the result of the action of the white light. Rapid walking or other exercise will bring about such vibration, and a slight pressure of the lids or even the rotation of the globe, while studying the after-image, will always change its character. And it must also be remembered that unless we use direct sunlight or the electric light we can never be sure that we have the proper proportion of the various colours constituting white light. In almost if not quite all reflected light there is predominance of some one colour, which, however, would only reveal itself when viewed in contrast with pure white. How far these circumstances have tended to the different results in each case we have, of course, no means of determining. The only fact of importance which we can draw from them so far as the retina is concerned is its impressibility to the various colour-waves. From my own experiments I am led to infer that the shorter waves (blue) affect the retina most easily and strongly at first, and overpower the other vibrations by their intensity. They, however, are sooner exhausted than the others, which take a longer time to affect it, but whose vibrations last longer, just as we find it in the case of short and long strings, for example. It will be seen that the order of disappearance in my experiments follows pretty regularly the colours of the spectrum from the blue to the red end, and I am inclined to think that under entirely favourable circumstances this is the natural order, and in so far as that is true the residual sensation of white light would tend to support the new rather than the Young-Helmholtz theory, as being in keeping with the known laws of molecular vibration. It would, however, be much more in keeping with the Young-Helmholtz than the Hering theory. It strikes, to my mind, at the foundations of the latter, inasmuch as it makes white light act in the

greater and more lasting degree on the red-green and blue-yellow substance than on its own peculiar substance. But, after all, we must not be too hasty in concluding that the phenomena are wholly retinal. We have to do in these experiments, it must be remembered, with sensations, and the seat of sensation is in the cerebral centre. However, in any case we know that we are dealing with the result of wave and molecular motion, which, whether in the retina or the brain centre, must be in keeping by well-demonstrated physical laws.

Central Colour-perception.—After this endeavour to transfer the function of perceiving colour impressions from the retina to the brain, it remains to say something in regard to a possible manner in which these impressions are finally converted into colour sensations.

It must be confessed at the outset, that since we have abandoned, in a large measure, the domain of physics and physiology and have entered that of psychics, we shall be lacking in a most regretful degree in those positive data which have lain at the basis of our studies heretofore, and for demonstrable facts we must now substitute plausible speculation. It is not possible for the human mind to conceive how any impression is converted into a sensation. In our imagination we can follow the changes produced by the affecting agent, it may be up to the most delicate alteration in the ultimate atoms or molecules of the brain-substance, but between these atomic or molecular changes and the consciousness we demonstrate sensation there is a gulf fixed which is impassable by the finite mind. But up to the physical edge of the gulf we can legitimately follow the various stages of the phenomena.

The first question that would naturally arise is, whether there is a certain portion of the brain-substance set apart to preside over the function of the colour-sense. It seems now to be pretty conclusively demonstrated that there is a certain portion of the brain, situated in the cortical substance of the occipital lobe of the cerebrum, which is intimately connected with the function of vision. But, as the sense of vision comprehends the separate sensation of form—white- and coloured-vision, it is a pertinent question whether the same cerebral cells or molecules are concerned in the production of all three sensations, or whether there are separate centres for each.

If we allow that there are three separate centres, we must also admit three separate fibres going from each percipient element of the retina to each of the centres, since each separate percipient retinal element is concerned in all three functions. This would burden us with a multiplicity of fibres and lead us into a maze of complications from which it would be difficult to free ourselves. We should be likely on this theory to have an affection of any one of the centres, leaving the others intact, that is, we should have a distinct light-, form-, and colour-blindness.

No cases of separate light- or form-blindness have, so far as my knowl-

edge extends, been reported, but there are cases of hemi-achromatopsia (light and form sense being intact) on record, and these give sufficient plausibility to the supposition of a distinct colour-centre to warrant a consideration of its merits.

When we come to look at the phenomena of vision as a whole, we can divide them broadly into two classes: those of quantitative and those of qualitative distinction. The sense of form, so far as it relates to the sense of vision, we would suppose to depend upon the number of retinal elements affected, and their relations to each other in space. Colour we would look upon as the result of a discrimination between the changes produced by ether waves of different lengths; while the sense of light (white) would be the sum of all these wave impressions occurring at the same time. I would, therefore, suppose one cerebral atom or molecule corresponding to each percipient retinal element with which it is connected by means of an optic nerve fibre. In other words, the cerebral mass concerned in the reception and perception of the impressions made on the retina need not be greater than that of the retina itself, for if the mass of the retina is sufficient for their reception, a corresponding cerebral mass should be sufficient for their perception; and this, we think, taking into consideration the extent of gray matter in the convolutions is not making an excessive demand.

Are there then different parts of this mass set apart for the perception of the different colours? I do not see the necessity for this. I would suppose the cerebral molecules or atoms to be capable of vibrating in the same phases as their corresponding molecules in the retina, or, going farther back still, in the substance of the luminous body itself. Of course, under this hypothesis it is not demanded that there be a special phase of vibration for every distinctly-perceptible colour and shade. It is still possible to divide colours into "primary" and "combination." As for myself, I should regard as "primary" all those colours which are clearly distinguished as such in the full solar spectrum. All others I would regard as "combination colours."

Those cases of hemi-achromatopsia which have been observed, I would explain on the supposition that, from some cause, the cerebral molecules of one side were rendered incapable of responding to the phases which corresponded to the missing colour or colours, or it might be that pressure or other alteration in one optic tract prevented the fibres from carrying the wave-motion representing that colour from the retinæ to the brain.

Charpentier has endeavoured to prove that the perception of white light is distinct from that of colours. It is true that white light is perceived further towards the periphery of the retina than any single colour, and that some colours are lost before others—green, for instance, being the first to disappear, and blue last. But his own experiments have proved

when the *intensity* of green is increased sufficiently it can be distinguished as peripherally as blue. In other words, as we go towards the periphery of the retina we require a greater intensity of wave-action in order to have an impression. Now it must be evident that white light, since it is the sum of all colour-vibrations, must be more intense in its action than any one colour-vibration, and hence must be perceived more peripherally than any single colour. It seems, therefore, useless to suppose a separate centre for the perception of white light, and it is rendered doubly unnecessary from the fact that there is no white light which cannot be resolved into the spectral colours. It is a well-demonstrated fact in physics that white light is not simple but compound, and made up of different colours, and thus a centre for white must of necessity comprise a centre for all the colours of which it is composed.

As directly connected with the question of cerebral colour-perception we would call attention to the phenomenon of "coloured audition," instances of which have recently been brought to notice. In these cases certain notes (corresponding to certain definite aerial vibrations) have associated with their perception the sensation of certain colours. This is most satisfactorily accounted for on the supposition that the vibrations in the cerebral centre of audition, caused by the action of sound-waves on the terminal filaments of the acoustic nerve, have, in some manner, probably from close contact of the two centres, been communicated to the visual centre, since, according to the theory of the "specific energy of nerves," any disturbance of the molecules of the visual centre is associated with a sensation of vision. All this is in perfect keeping with the evolutional development of the senses as now commonly held by biologists.

ARTICLE V.

UNILATERAL SWELLING OF HYSTERICAL HEMIPLEGIA.

By S. WEIR MITCHELL, M.D.[1]

I HAVE notes of three cases of hysteria, in which there was unilateral increase in bulk at or near the menstrual period, and also at other seasons after emotional excitement. I do not recall any narration of such cases elsewhere, nor can I find them described, but probably such facts may have been seen by observers.

CASE I.—Four years ago I was consulted by Mrs. C. P., æt. 43, of Arkansas, a woman of accomplishments and unusual intelligence, accustomed to luxury, and the perfectly healthy mother of four children, until a sudden calamity destroyed her husband's fortunes. At this season her

[1] Read before the Neurological Society of Philadelphia on April 2.

menstruation, ceasing abruptly, came back no more, and she was seized with palpitation, hysterical laughter and tears, colics, and, finally, with attacks of a cataleptic nature. After a month of such illness Mrs. P. was able to walk, but continued hysterically wretched for two years, with the usual round of ovarian pains, anorexia, emesis, etc. In May she was brought to me, a rather florid woman; height 5 feet 4 inches, weight 148 pounds. Her general hysteria was better, but she had unilateral loss of the sense of pain and temperature on the left side, with good power to feel, touch, and to tell where she was touched. These peculiarities involved all of the side, but none of the special senses suffered. There was some loss of power, but more in the hand than the leg, so that her gait was but little affected. In all respects, save one, this was a case of commonplace hysterical hemiplegia, but the exception was a striking one, and must have escaped me but for a watchful nurse, who, observing that Mrs. P.'s left leg was larger than the right, mentioned it to me. The patient had herself noticed the difference, of which, as it was well marked at the time, I made a careful study.

The left arm was slightly larger than the right, and the enlargement extended to at least the first phalanges. At another time the left side of the abdomen and the left mamma were said to have been of unusual size. This I never saw, but was assured of by the nurse. The left leg was remarkably bigger than the right; as thus, it was larger by $2\frac{1}{2}$ inches at the groin, by $1\frac{3}{4}$ inches above the knee, by 1 inch at the mid-calf. The ankle and foot shared in the fulness, and with great difficulty and long pressure I obtained slight evidence of œdema on the instep and over the tibia, but none elsewhere. The temperature was always slightly below that of the right leg $\frac{1}{4}$ to $\frac{3}{4}$° F. No distinct symptoms, save sense of weight, attended the gain in size; no throbbing, no perception of numbness. Later on I learned by observation that it was certain to coincide with an increase in the sensory loss, of which she herself was not usually aware. At the approach of the menstrual flow the swelling was most notable, but it certainly lessened when the menstrual blood began to come away, and either gradually or abruptly returned in variable amount afterwards.

Again and again I witnessed the same change. On one occasion a delayed telegram produced hysterical rigors, and within four hours as great a change in the whole side as had ever been seen. The breast I did not see, but the nurse said it was plainly enlarged, and certainly both arm and leg were. I may add that I never saw the face swollen, and that there was no perceptible œdema of the hand.

This lady left my care after two months, but reclaimed it a year and a half later, when again I saw and studied anew the interesting condition I have here described. At this later date I examined the bloodvessels with care, and found that under a tight bandage the size of the leg could be readily lessened, and that it was some hours before it regained its abnormal diameter. At this time the loss of sensation and the absence of bleeding from pin-pricks were still well marked, and caused me to make many efforts by metals, glass, wood, blisters, and magnets to obtain the phenomenon of transfer, for I was anxious to see what would happen as regards the size of the leg when the sensation symptoms left it. It proved, unluckily, one of the hysterical paralyses which refuse to exhibit this phenomenon.

By degrees this woman got well, and is now a vigorous and wholesome person, the changes in the leg having disappeared with the relief of the

paresis, which came long after the patient had regained a state of apparent good health.

CASE II.—I saw a second case, Mrs. J., æt. 37, last year. There was in this one merely general nervousness, hysterical sense of fatigue, and a swollen left ovary—imprisoned by the relics of a cellulitis. The patient was in wretched condition as to appetite and digestion, but was not emaciated. In her case the left leg was nearly always a little the larger, but at times, and within a few hours, it became very much swollen, and this was sure to happen at the monthly period. It is to be remembered that in this second case we had but a slight and not constant defect of sensation, no obvious hemiparesis, and no trace of œdema, if we accept the pressure test as competent, no throbbing, and no fall of temperature exceeding two-tenths of a degree. I thought the limb looked more ruddy than its fellow, but was not sure. Careful measurements confirmed what was obvious to the eye, the increase in size, and the change which often came about in a few hours.

CASE III.—The third case, a young lady, æt. 26, from Connecticut, of noble form, and in exceptionally good health, had a grave attack of cerebral meningitis, out of which she came with very severe occipital headaches and pains in the spine and shoulders, without tenderness. As time went on, she had several attacks of hystero-epilepsy, followed by stupor and brief delirium, and at last brought out of one of these onsets a left-sided lack of power, analgesia, and retained tact sense, with impaired thermal sense. Her nurse called my attention during an attack of the epilepsy to the remarkable difference in size between the legs, and insisted that it became greatest during the early days of menstruation, and then much less, and that emotional pleasure, as a concert or dancing, was sure to increase it. The legs were strong, firm, and nearly perfect as to tint and warmth. There was a variable but distinct amount of œdema about the left ankle, and at times this was absent. It was certain that the right leg also occasionally became somewhat enlarged, but the change was not so marked as in the left leg, and when it took place to a notable degree, it was always accompanied by more or less right-sided development of the hysterical symptoms constantly present on the left side. The temperature of the legs was nearly the same or was slightly higher, two-tenths degree, in the right.

The left limb was visibly much enlarged. Its bulk varied from day to day, or during each day. Sometimes it was largest on the patient's awakening in the morning, or else was smallest then. Walking did not seem to increase it, but very often, if pushed to fatigue, caused rigidity of the leg, and brief attacks of blurred or lost consciousness, holding the same relation to the hystero-epileptic attacks as in ordinary epilepsy the *petit mal* bears to the *grand mal*. Long standing did not increase the size of the leg on the other hand. The approach of menstruation somewhat enlarged the limb, but not always. Emotion, pleasurable or painful, had a like influence. During menstruation the leg was apt to become smaller, and the change was always most notable in the thigh. It will thus be seen from the table that the left leg measured 30 inches just below the crotch the day before menstruation began, and 26½ inches the day before it ceased. The tables appended show the great variability of this condition. Hitherto I have spoken chiefly of the leg, because in it the change was most remarkable. It was not visible in the face or the left breast, but was obvious in the left arm, and sometimes in the hand.

Saturday, December 22.

	Ankle.	Calf.	Knee.	Above knee.	Below crotch.	Crotch.
Right,	9½	16	16	17½	21	28½
Left,	9½	16½	16½	19	23	30

Sunday, December 23, menstruation began.

Right,	9½	15	16	17½	23⅞	27½
Left,	10	16½	16½	22⅜	26	26½
Right,	9½	16	17	20½	24⅜	26
Left,	9⅜	16½	18	20⅜	25	28
Right,	8⅞	16	15⅞	19⅜	20½	26
Left,	9⅜	16⅜	17½	20½	25½	26⅜

Before walk.

Right,	9	15⅜	16½	19½	23½	27
Left,	9¼	16¼	17⅜	20½	24	28½

After walk.

Right,	9½	15½	16½	21⅜	24	25½
Left,	10	16⅜	16¼	22¼	26	26½

Sunday, December 30, menstruation ended.

Left,	9⅜	16⅜	16½	20½	24	28½

Monday, December 31, after a long walk.

Left,	9½	16½	16½	19	24	26⅜

Sunday, January 6.

Right,	8¾	14⅜	16	17½	22½	25
Left,	9	16	17	23½	23¼	27

Sunday, January 6, *evening*.

Right,	9	15½	19¼	23½	25½	25
Left,	9⅛	16¾	20	24	25¾	26½

Monday, January 7.

Right,	8¾	15½	18¼	18	23½	25½
Left,	9½	15½	16	18½	21¼	26

Tuesday, January 8.

Right,	9	15½	15⅜	17½	17¾	23
Left,	9	16½	16	23¾	22	25½

Wednesday, January 9, no walk, and stiff.

Right,	8	15	16½	19½	23⅜	25½
Left,	9¼	16¼	16⅜	21½	26⅜	27

Thursday, January 10.

Right,	9	15½	16¼	18½	23¼	25½
Left,	9½	16	17¼	21½	25½	27

As the case improved the unilateral change of size became less noticeable, and always a grave onset of hystero-epilepsy brought it back in its worst degree, and then with some defect of feeling in the right leg came also slight swelling, which was never permanent. When I personally examined the two legs they were much alike in temperature. They could not be made to pit except by prolonged pressure over the shin bone, and then the indentation was slight. The left leg felt as if its areolar tissues were firmer than those of its fellow.

It seems quite probable that this enlargement may, if looked for with care, be found in other cases of hysterical hemiplegia. But what is its nature? It is certainly not all, or much of it, a mere increase of areolar serum or œdema, and it does not appear to resemble the instances of

vasal paralysis I have elsewhere described, for neither does the leg throb, nor exhibit a notable rise in temperature or a change in tint. I do not find it much more easy to identify the condition with any form of lymph-œdema, which it most resembles, for in that disorder there is more obvious œdema, and it is also quite permanent.

It will have been noticed in my last case, that while the left leg remained nearly always the larger, the right leg also varied a good deal in bulk, and perhaps there may be normal variations as to which I have never heard that any one has inquired. Whatever conclusions we may reach as to the immediate cause of the unilateral differences in size I have here described, it is at least clear that they are under the influence of the nervous system, and vary with the causes which also increase or lessen the analgesia, or give rise to chronic spasm. Beyond this I can as yet hardly go. Most probably it will be found that in many unilateral hysteric palsies a like phenomenon exists, and has merely escaped attention because of being the least prominent in a group of symptoms. At all events, it adds another to the large group of resemblances which so closely relate organic hemipalsy to hysteric hemipalsy.

I should add that my first two cases seemed to me but merely curious until my interest was more fully excited by the third case. In it my means of studying were limited, since always an inspection of the legs caused an attack of hystero-epilepsy to which I felt that I had no right to expose my patient.

Last week I saw a case of hemiparesis, with analgesia, and, like all the other cases, on the left side. There was distinct difference in the bulk of the legs, but only in the thighs—the left being from one-third to one-half inch large midway, and one inch at the crotch. As there is no œdema, and the case is an old one, possibly the difference in girth may be original and not acquired through disease.

ARTICLE VI.

A CASE OF TUBAL PREGNANCY.[1] By HENRY HUN, M.D., Lecturer on Nervous Diseases in the Albany Medical College.

MRS. T., a Scotch woman, 36 years old, married, had always been remarkably healthy; she had had one miscarriage, and had given birth to seven children, the youngest of whom was thirteen months old and was still nursing at the time of her mother's death.

Since the birth of her baby the patient had menstruated once. This menstruation commenced seven days before her death, lasted three days,

[1] The following case occurred in the practice of Dr. Wm. L. Purple, of Albany, who has kindly allowed me to examine the specimen and report the case.

and was, as far as could be ascertained, entirely normal. On September 7, 1882, three days after her menstruation had ceased, she was suddenly seized at about half past seven in the evening with great pain in the right inguinal region. She did not suspect that she was pregnant, and attributed the pain to colic. Soon after the pain commenced she had an operation of the bowels, and after taking a mixture of whiskey and mustard which her husband prepared for her, she vomited a little. On the same evening Dr. W. H. Fowler was called in and prescribed stimulants, and a little morphine.

On the afternoon of the next day Dr. Purple saw the patient for the first time. She was then in a condition of collapse, with cold extremities, pale face, and a pulse so small and rapid that it could not be counted.

Patient complained of some pain in lower part of abdomen, but especially of great weakness. Dr. Purple ordered stimulants, but about half an hour later the patient had a convulsion and died.

At the autopsy, which was held twenty hours after death, a quart or more of blood, partly fluid, partly in the form of a black clot, was found in the pelvis and in the lower part of the abdominal cavity. The abdominal organs, especially the uterus and kidneys, were very anæmic. There was no injection of the vessels of the peritoneum, and no traces of either recent or old peritonitis.

The right Fallopian tube at its middle was enlarged and formed an ovoid swelling of dark red colour, about two inches in its long and one inch in its short diameter. On the posterior surface of this swelling was a small rent, about one-fifth of an inch long, through which the blood had passed out into the peritoneal cavity, and from which at the time of the autopsy protruded a small cyst filled with a clear fluid. In the centre of the cyst was floating a small embryo. There was a considerable quantity of amniotic fluid, so that the embryo could float about freely, and a short umbilical cord could be plainly seen connecting the embryo with the wall of the cyst. No umbilical vesicle could be seen, which does not prove that none was present; for at this stage of the autopsy, which was performed by the light of one lamp, the cyst and the umbilical cord both accidentally ruptured, and when the embryo was put into alcohol for future examination no umbilical vesicle was connected with it. On the outer side of the chorion were a great number of villi, and these were especially numerous at a point just opposite to the point of rupture. Between the ovum and the walls of the Fallopian tube was a blood clot, firmer, of higher colour, and apparently of slightly older date than the blood clot found in the peritoneal cavity. Nothing like a decidua could be discovered macroscopically or microscopically. The walls of the tumour were composed of the Fallopian tube, which was more vascular than usual, and in which there was a slight amount of round cell infiltration. The effusion of blood had taken place in this wall, and had broken through the mucous coat and worked its way between the ovum and the walls of the Fallopian tube which surrounded it. No large vessel could be found from which the hemorrhage had proceeded. A probe introduced into the abdominal opening of the Fallopian tube penetrated until near the ovoid swelling where it was arrested by the adherence of the walls of the tube. From the ovoid swelling to the uterus, the Fallopian tube was occluded by an adherence of its walls.

The left Fallopian tube was normal. The left ovary presented on its surface several linear scars, but its form and colour were normal. On sec-

tion of the ovary underneath a linear scar a corpus luteum was found one-half by three-fourths of an inch in diameter, of oval form, and limited by a well-marked white capsule. At that point of the corpus luteum which was nearest the surface of the ovary was a small cavity divided by a delicate partition into two equal parts, the greatest diameter of the cavity being one-eighth of an inch. The rest of the mass of the corpus luteum was made up of yellow tissue. Numerous sections were made through the right ovary, but nothing like a corpus luteum of pregnancy was found. One corpus luteum was found in which all the yellow matter had been absorbed, and where the white lining walls were almost in apposition, leaving a small linear cavity with somewhat irregular margins.

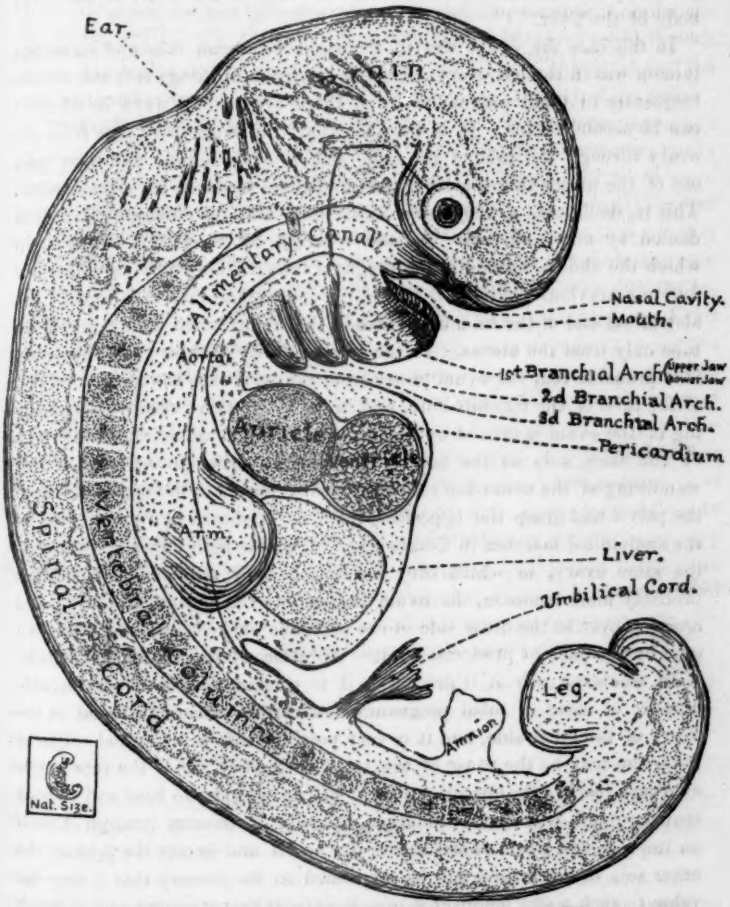
The uterus was pale and not appreciably enlarged; the distance from the external os to the fundus being two inches. Its walls were one-half inch thick, its inner surface was slightly rough. Over the greater part of the body no trace of a decidua could be seen either by the naked eye or by the aid of the microscope, but near the internal os there was a small fragment of what appeared to be a decidua.

The embryo found at this autopsy is worthy of notice. It is coiled up, forming an arch. Its length in its coiled-up position is a little less than three-eighths of an inch, and if straightened out it would probably measure one-half an inch. Judging from the length of the embryo and the development of its organs it is between twenty-five and twenty-eight days' old. The accompanying plate is an accurate drawing made with the camera lucida of the embryo after it had been rendered transparent by oil of cloves. Projecting from the ventral surface is the umbilical cord, which is just above a small, square fragment of the amnion. The umbilical cord, which is very nearly the middle point of a child at term, is in this case very near the lower end of the embryo.

The legs and arms are represented by little buds springing out on each side of the body. The vertebræ, with their centres of ossification, are very distinct, and are the only traces of bone that can be seen. The nervous system is developed out of all proportion to the other organs, and in point of size is nearly equal to all the rest of the embryo. The delicate nature of the nervous tissue is also seen in that, although it was preserved as carefully as possible, being put immediately into weak alcohol, the strength of which was gradually and rapidly increased, yet the nervous tissue does not have its original form, but its outlines are wavy and it has the appearance of a semi-fluid body which has coagulated. The angle which the medulla oblongata makes with the spinal cord, and the still greater angle which the hemispheres make with the ganglia at the base of the brain, are plainly seen.

The ventral surface of the embryo has almost entirely closed along the median line. The branchial arches are well formed; the upper one is divided into the upper and lower jaws, leaving the cavity of the mouth between them. The nasal cavity is also widely open. At the base of the second branchial arch the ear can be seen, but its structure cannot be

made out. The eye, however, is well formed, and shows the lens lying free and surrounded by the retina. The heart and aorta are very distinct. The arch of the aorta can be seen indistinctly bending downwards behind



"The sharp and distinct lines of the drawing, although entirely accurate, are in marked contrast to the delicate outlines of the embryo. The heavy line which arches backwards from the eye to the base of the first branchial cleft, appears under the microscope as a depression upon the surface of the embryo; while the outlines of the alimentary canal are so indistinct that they can only here and there be made out."

the second and third branchial arches. The aorta appears to spring from the auricle, but with proper focusing it is seen to pass behind the auricle to the ventricle. The heart is surrounded by the pericardium, and the

ventricle is made up of a sort of spongy tissue, which is not very well shown in the drawing. The trabeculæ of this spongy tissue, in the further development of the embryo, are gradually forced more and more to the periphery and form the columnæ carneæ. Below the heart is the large body of the liver.

In this case the ovum was in the right Fallopian tube and its corpus luteum was in the left ovary. Such a condition of things is found not infrequently in tubal pregnancies, and there are several ways in which it can be accounted for. It is possible that the ovum may pass from the ovary through the tube of the same side into the uterus and then pass out of the uterus into the other tube and there go on in its development. This is, doubtless, a very rare occurrence, and its possibility has been denied by many authors. A case reported by Schultze,[1] however, in which the abdominal end of the pregnant tube was closed by old adhesions due to a previous peritonitis, leaves no doubt that this may occur; the abdominal end of the tube being closed the ovum could have entered the tube only from the uterus. In the great majority of these cases, however, is is probable that the ovum passes from the ovary into the abdominal end of the tube of the opposite side, and in many of these cases this wandering of the ovum is proved by the occlusion by old adhesions of the tube on the same side as the corpus luteum. In order to accomplish this wandering of the ovum the tube may swing across to the opposite side of the pelvis and grasp the opposite ovary, as is shown in a preparation in the anatomical museum in Cambridge,[2] in which both tubes are grasping the same ovary, to which they are attached by adhesions, or, what is probably more common, the ovum passes into the peritoneal cavity, and crossing over to the other side of the pelvis is sucked into the Fallopian tube by the current produced by the vibration of its ciliated epithelium.

In whatever way it is produced, it is certain that in a considerable number of cases of tubal pregnancy the corpus luteum is found in the ovary of the other side, and it is very possible that this unusual origin of the ovum may be the cause of the tubal pregnancy, for if the tube bends over and reaches the opposite ovary it will be apt to be so bent and twisted that the ovum will meet with great difficulty in passing through it, or if an impregnated ovum passes across the pelvis and enters the tube of the other side so much time will be consumed in its journey that it may develop to such a size before it gets to the uterus that it cannot pass through the tube, and will continue its development in this organ. This is the only cause which we can assume in our case, for there was no occlusion of the tube by tumors, bands of adhesions, or displacements of the uterus, as are sometimes found in these cases; neither was there any great fright or

[1] Hassfurther von der Ueberwanderung des menschlichen Eies, Dissert. Inaug. Jena, 1868.

[2] Parry on Extra-uterine Pregnancy, page 75, Philadelphia, 1876.

emotion experienced at or near the time of sexual intercourse, which in a number of such cases has appeared to cause the extra-uterine pregnancy.

The adhesion of the walls of the Fallopian tube on each side of the tumour in this case is what is usually found. It must have occurred after the ovum reached its place of development in the tube, because the occlusion was on both sides of the ovum, although, as is usual in such cases, the occlusion was much more extensive between the ovum and the uterus than between the ovum and the fimbriated extremity of the tube.

Probably in all cases of tubal pregnancy there is a decidua formed in the uterus which may be cast off at any time during the pregnancy, but in many cases is not cast off till the end of eight or nine months, when regular labour-pains come on. In our case the decidua was probably cast off at the menstruation or the metrorrhagia, for it can well be doubted whether this was a true menstruation, which ceased four days before death; only a small fragment near the cervix remaining. It seems likely that the increased congestion of the internal genital organs attendant upon this menstruation or metrorrhagia led to a slight hemorrhage between the ovum and the surrounding walls of the tube. The increased pressure in the tumour due to this extravasation of blood finally led to its rupture and the escape of blood into the peritoneal cavity, which caused the pain, the collapse, and the death of the patient. In support of this is the fact that the blood-found in the tube was firmer, more organized, and apparently of older date than the blood in the peritoneal cavity. It has been noticed in cases of extra-uterine pregnancy that menstruation or metrorrhagia very often immediately precedes rupture of the cyst. In this case the rupture of the cyst took place a month or two earlier than is usual in cases of tubal pregnancy. In the first six weeks of tubal pregnancy rupture of the cyst is either very rare or else it does not cause the death of the patient.

ARTICLE VII.

TRAUMATIC CEPHALHYDROCELE; WITH A REPORT OF TWO CASES.[1] By P. S. CONNER, M.D., Professor of Anatomy and Clinical Surgery in the Medical College of Ohio, etc.

COMPOUND fracture of the skull, especially of its base, with resulting escape of the cerebro-spinal fluid, is, as every one knows, a common accident; but the occurrence of subfascial accumulation of this fluid, in connection with and consequent upon simple fracture of the vault, is of such rarity that I trust I may be pardoned for bringing to the notice of the Association two cases that have recently come under my observation.

[1] Read before the American Surgical Association Washington, April 30, 1884.

CASE I.—H. M., æt. 12½, a healthy, well-developed active boy, on the 11th of October, 1883, fell from a wagon-seat on which he was riding, and a wheel passed over his head. He was not rendered unconscious, and quickly getting up walked, unassisted, into a house near by. When seen an hour and a half later by Dr. A. M. Brown,[1] he was found to have received a multiple fracture of the lower jaw (near the symphysis and in front of each angle), a lacerated and contused wound of the left eyebrow, and a simple depressed fracture of nearly the whole of the right half of the occipital bone above the superior curved line and of the parts bordering upon the masto-parietal suture. A marked swelling was present over the fracture area, which was not noticed to pulsate, and was supposed to be due to blood extravasation. At the expiration of a week, no absorption having taken place and a slight serous discharge from the nose having commenced, associated with some puffiness of the right eyebrow, Dr. Brown put a small trocar into the swelling and drew off ℥iv of fluid of pale straw-colour. The sac rapidly refilled, and after four weeks it was tapped again, ℥v being taken away. Subsequently the operation was repeated four times, at intervals of four, three, four, and two weeks, the amounts of fluid removed being ℥v, ℥iij, ℥xj, ℥v, making in all ℥xix. The third tapping I made, using the aspirator. The fluid withdrawn was perfectly clear and colourless, becoming turbid only after standing a day or more; it had a sp. gr. of 1007, contained no albumen, or but a trace, no sugar, and the chloride of sodium was present in proportion of 6.6 parts per thousand.

At no time while under treatment was the boy unconscious or delirious; but his mental condition was always one of marked irritability, and at times there was decided insomnia. Irregular shooting pains in the head were frequently complained of; and at the time I aspirated, the drawing off of the fluid was stopped because of the occurrence of decided pain in the front and right side of the head, which continued with progressively lessening severity during the succeeding forty-eight hours. No muscular twitchings were at any time observed. The temperature never rose above 100° F. The heart's action was irritable, and for weeks the pulse ranged between 100 and 120. Now, six months after the receipt of the injury, the temperature is normal, the pulse-rate 85, and the boy is in excellent general condition; but he is markedly more peevish and fretful than he was before he was hurt. There is a deep depression, 3½ × 1½ inches, in the right occipito-temporal region, and the outer surface of the originally detached large piece of bone is on a level with the inner surface of the skull around. The subaponeurotic sac still exists, and contains a small quantity of fluid, perhaps from ℥j to ℥ij. Pulsation synchronous with that of the heart, though not strongly marked, can be distinctly both felt and seen. The point or points of communication with the intracranial space cannot be discovered.

CASE II.[2]—J. W., coloured, æt. 27 months, hydrocephalic and rachitic, fell from a height of four or five feet, striking on its head; no scalp wound produced. Was rendered unconscious and remained so for several hours. Very quickly there came on a swelling on the head, which a few days

[1] Under whose care he was, with whom I several times saw the case in consultation and to whom I am indebted for much of the history here given.

[2] It was but a few days ago, since this paper was written, that my attention was called to this case by my colleague Dr. D. S. Young, under whose care the child came when admitted to hospital.

later (Aug. 9, 1883), when the child was admitted into the Cincinnati Hospital, was found to be located over the right parietal bone extending forward a little on to the frontal, to measure $4\frac{1}{2} \times 3\frac{1}{2}$ inches, and to be fluctuating and pulsating. Neither fontanelle had as yet closed, and there was a membranous interspace about $1\frac{1}{2}$ inch wide between the parietals; and probably one between the parietals and the frontal, though on this point I cannot get definite information. Through the swelling there could be felt a radiating fracture of the parietal, the bone superiorly and posteriorly being somewhat forced upwards and outwards. The child while in hospital has never been unconscious or delirious, or unusually peevish. It was many weeks before it was able to stand alone, and only quite recently has it begun to walk. It has had no operative treatment of any kind at any time. Now, nine months after the accident, the fontanelles are closed; the parietals are ossified up to the sagittal suture; there is apparently no subaponeurotic sac containing fluid, though pulsation can be distinctly felt through a membranous space which, of irregular shape 1 inch in its greatest diameter, lies along the course of the coronal suture from a point 3 inches below the bregma. A broad, much elevated, bony ridge surrounds the original fracture-area, and clearly indicates the position and size of the subaponeurotic tumour. In some respects this case is like the one reported by Mr. Erichsen.

As far as I have been able to ascertain, there have been reported but 19 cases (including my own) of subfascial accumulation of the cerebro-spinal fluid after simple vault fracture, and three others where there had been originally a communicating wound of the scalp which had closed, two of these three being cases of gunshot injury, and in the third the skull had been trephined. That the fluid is the cerebro-spinal cannot, I think, be questioned, since whenever examined there have been found nearly or quite the same specific gravity and the characteristic absence of albumen and abundance of the chloride of sodium. Sugar has not been present, neither has it always been in the analyzed specimens of undoubted cerebro-spinal fluid; indeed, according to Hoppe-Seyler, it "only occurs as a result of irritation or inflammation of the brain or spinal cord." Further it may be noted that in the case that I saw, when the sac was very much distended there came on a serous discharge from the nose, and in Haward's case the conjunctiva burst and a large quantity of fluid escaped, and it is a recognized fact that there is a direct communication between the subarachnoid cavity and the nasal and ocular lymph-spaces.

Mr. Clement Lucas, in reporting his second case (*Guy's Hospital Reports*, 1880–81), expresses his belief that the discharge comes, not from the subarachnoid space, but from the ventricular cavity; and post-mortem examination of his first case, which lived a year and nine months after the receipt of the injury, proved that "the cerebro-spinal tumour had communicated with the lateral ventricle, the descending and posterior cornua of which had become together dilated into a large cavity adherent to the skull." As indicating the correctness of this belief of Mr. Lucas, it may be noticed that communication with the lateral ventricle was upon

No.	Reporter.	Authority.	Sex	Age.	Location of fracture.	Time of appearance of tumour after receipt of injury.	Operative treatment.	Result.	Time of death.	Cause of death.	Remarks.
1	Marjolin,	Vivien, Thèse de Paris, No. 440, 1883.	M.	16 mos.	Upper and posterior left parietal region.	4 months.	2 tappings.	Recovery.	.....	.....	Pulsation noticed.
2	Haward,	Lond. Lancet, July 17, 1869.	M.	19 mos.	Right frontal region.	At once.	1 tapping.	Death.	12 days after puncture.	Meningo-encephalitis.	Pulsation noticed.
3	Giraldes,	Mal. Chirurg. des Enfants, 1869, p. 730.	M.	14 mos.	Posterior right parietal region.	A number of days.	2 tappings, 1 free incis.	Death.	20 days after first tapping.	Meningo-encephalitis.	
4	Potain,	Vivien, op. cit.	F.	7 mos.	Posterior right parietal region.	Unknown	3 tappings.	Death.	18 days after first puncture	Meningo-encephalitis.	
5	Erichsen,	"Surgery," Am. ed., 1878, vol. i. p. 534.	..	Child	Left side of skull.	Very soon	2 tappings.	Death.	10 days after injury.	Meningo-encephalitis.	Child hydrocephalic.
6	Lucas,	Guy's Hosp. Reports, 1876, p. 363.	F.	2 yrs.	Left temporal region.	About 2 weeks.	1 aspiration.	Death.	21 months after injury.	Meningo-encephalitis.	
7	Emery,	Bul. de la Soc. Anatom., 1876, p. 36.	..	2 yrs.	Frontal region.	Unknown	1 tapping 6 mos. after fall, followed by free incision.	Death.	.....	Erysipelas and meningitis.	
8	Schmitz,	Handb. der Chir., Billroth & Lücke, L. 30, S. 152.	..	5 mos.	Lower right parietal region.	10 days.	3 punctures and compression.	Unknown.	.....	.....	Removed from hospital while under treatment. Mistaken for hæmatoma.
9	Weinlechner,	Jahrbuch f. Kinderheilkunde, B. 18, S. 367.	M.	3 yrs.	Left parieto-occipital region.	Soon.	None.	Recovery.	.....	.....	When first seen by Weinlechner, boy was 15 years old, and an epileptic. Pulsation noticed.
10	Weinlechner,	Jahrbuch f. Kinderheilkunde, B. 18, S. 367.	F.	7 mos.	Right parietal region.	Immediately.	None.	Recovery.	.....	.....	Died some months later of smallpox. Pulsation noticed.
11	Weinlechner,	Jahrbuch f. Kinderheilkunde, B. 18, S. 367.	F.	4 mos.	Left parietal region.	Immediately.	None.	Recovery.	.....	.....	Was living more than five years later. Pulsation noticed.
12	Weinlechner,	Jahrbuch f. Kinderheilkunde, B. 18, S. 367.	M.	23 mos.	Posterior right parietal region.	Unknown	2 punctures.	Death.	9 days after 2d puncture.	Meningitis.	Pulsation noticed. Nothing known as to cause; hydrocephalic. Post-mortem showed communication with lateral ventricle.
13	Weinlechner,	Jahrbuch f. Kinderheilkunde, B. 18, S. 367.	M.	7 mos.	Right parietal region.	Unknown	3 punctures with cataract needle.	Death.	6 days after 3d puncture.	Meningitis.	Cause unknown. Fissure present in parietal bone.

No.	Reporter.	Authority.	Sex	Age.	Location of fracture.	Time of appearance of tumour after receipt of injury.	Operative treatment.	Result.	Time of death.	Cause of death.	Remarks.
14	Billroth,	Langenbeck's Archiv f. klin. Chir., B. 3, S. 398.	F.	At birth.	Right parietal region.	Several days after delivery.	5 punctures 2 iodine injections.	Death.	6 days after 5th puncture.	Meningitis.	When seen by Billroth was 2½ years old. Injury produced by forceps at time of delivery. Post-mortem showed communication with right lateral ventricle.
15	Kraussold,	Langenbeck's Archiv f. klin. Chir., B. 20, S. 828.	..	9 mos.	Right occipito-parietal region.	Unknown	2 punctures.	Recovery.	.....	.....	Case not seen until 9 months after injury. Pulsation noticed.
16	Reckitt,	London Lancet, June 4, 1881.	M.	2½ yrs.	Right temporo-parietal region.	2 or 3 days.	1 aspiration.	Recovery.	.....	.....	Squinting noticed at time of detection of tumour, disappeared after tapping. Persistent paraplegia from spinal injury.
17	Lucas,	Guy's Hosp. Reports, 1880–1, p. 91.	M.	23 mos.	Left frontal region.	17 days.	1 tapping with hypodermic needle.	Recovery.	.....	.....	Pulsation noticed.
18	Conner,	.....	M.	12½ yrs.	Right occipito-parieto-temporal reg.	At once.	5 punctures 1 aspirat'n.	Recovery.			
19	Conner,	.....	M.	27 mos.	Right parietal region.	At once.	None.	Recovery.	.....	.....	Child hydrocephalic and rachitic.
20	Lawson,	Trans. Path. Soc. Lond., 1870, p. 311.	M.	13½ yrs.	Left frontal region.	18 months after trephining.	Open'd with lancet point	Recovery.	.....	.....	Trephined on account of fracture.
21	Barton,	London Lancet, Feb. 12, 1881.	M.	22 yrs.	Left fronta region.	3 days.	Opening with probe of bullet wound on sixth day.	Recovery.	.....	.....	Pistol wound. Pulsation noticed. Disappearance of tumour and cessation of discharge in less than a week.
22	Verneuil,	Vivien, op. cit.	M.	52 yrs.	Right frontal region.	10 days after cicatrization of scalp wound.	Reopening of wound.	Death.	3½ months.	Abscess in right frontal lobe.	Pistol wound. Pulsation noticed.

autopsy found to exist in one of Weinlechner's cases and in the one reported upon by Billroth.

As far as has yet been observed, excluding those cases which were primarily compound, this traumatic cephalhydrocele is met with only in young subjects. One boy that I saw was, as has been stated, in his thirteenth year, but no one of the other seventeen patients whose ages are given (Mr. Erichsen simply refers to his as a child) was over three years old, seven being under 1 year, five between 1 and 2 years, and five between 2 and 3 years of age. Explanation of this fact is probably to be found, at least in part, in the great elasticity of the skull in infancy and early childhood, permitting of marked depression and fissuring of the vault without that associated wound of the scalp which would be likely to occur were ossification complete; and in part also in the much closer connection of the meninges and skull in children than in youths and adults. The exceptional occurrence of the tumour in a boy over twelve years old was, it may be, because the injury was produced not suddenly by a fall, but by a comparatively slowly-acting crowding force of no very great amount.

The very decided gravity of these cases is at once apparent, when we find that of the eighteen of simple fracture in which the result is known, nine (50 per cent.) died—eight of meningo-encephalitis and one of erysipelas and meningitis; and of the three in which the fracture was originally compound, one died (33 and one-third per cent.) of cerebral abscess. Even the supposed recoveries may be regarded with some suspicion, because of too early report; since Mr. Lucas's first case died of acute meningitis nearly a year and a half after it was discharged from hospital apparently well. In two of the fatal cases (Giraldès' and Emery's) death may fairly be attributed to the treatment employed—incision and seton—which permitted of the free admission of air into the cavity. In at least a decided percentage of the patients who recover, a morbid mental condition, indicated by irritability of temper, may be expected to be manifested; as was the case with Mr. Lucas's first patient, and with the elder boy whom I saw. Though complete consolidation of the fracture with resulting cutting off of the communication between the intra- and extra-cranial cavities may occur, it is, I believe, very unlikely in any case in which the opening has been large and the subaponeurotic accumulation great.

Whether developed early or late—and it has been observed almost immediately after the injury, and on the other hand not until after the expiration of four months—the positive recognition of the nature of the tumour can often be possible only after the removal of a portion of its contents. When pulsation is absent—and it either was actually wanting, or undetected, or at least unreported in more than one-half of the cases analyzed—notwithstanding the evident fluidity of the contents of the

swelling and the thinness of the percussion wave, the case will probably be regarded as one of hæmatoma, or, if manifested late, of deep-seated abscess.

When there is evident pulsation synchronous with the heart-beat; a normal-coloured thin scalp-covering, so thin it may be that translucency is observable; when increased fulness is apparent upon crying or holding the breath; when upon pressure a diminution in volume is readily effected with or without resulting symptoms of cerebral irritation, the diagnosis is clear and should be made at once: but under opposite conditions, when there is no pulsation; no translucency; no recognition of a cranial gap; nothing but the withdrawal of a fluid in appearance and chemical constitution similar to the cerebro-spinal fluid will determine the existence of a traumatic cephalhydrocele. In every case, therefore, where there is a subaponeurotic tumour and a history of a head injury having been received, if rapid subsidence of the swelling does not take place, an exploratory aspiration with at least the hypodermic syringe should be made.

As respects treatment, there is but little to be said. Internal medication cannot, I believe, have any direct influence either in restraining the effusion or promoting its absorption. Operative interference, if made at all, should be limited to the simple drawing off of the fluid. Free incision or the introduction of a seton (measures that have been employed) can only do harm and immensely increase the probability of a fatal result. Even aspiration or tapping with a fine trocar is advisable only when the amount of fluid accumulated has become so great that symptoms of intra-cranial pressure—pains; it may be squinting, as in Reckitt's case—are present, or there are indications of decided distension of the nasal or orbital lymph-spaces. Complete emptying of the sac need not be made, for rapid refilling may be expected; perhaps should not be made, for any considerable drawing off of the fluid from the intra-cranial spaces will at once give rise to symptoms of irritation. As I have already stated, I was compelled to suspend aspiration because of the supervention of pain in the forehead and in the side of the head; and such pain did not entirely disappear for two days.

It may be claimed that the presence of the fluid will delay or altogether prevent the repair of the existing fracture, and therefore it should be removed; but, unfortunately, the sac is in direct communication with the subarachnoid and ventricular cavities, and from these the fluid will quickly find its way back again into the space between the fragments. Mr. Clement Lucas believes that presence of the fluid is advantageous; lessening the risk of "acute cerebro-meningitis from the contact of angular fragments of bone with the surface of the brain."

Pressure has been employed, and if moderate is not likely to do harm, and may perhaps lessen the rapidity or the degree of the distension; but

no possible good can be effected by firm pressure, which will almost certainly produce or increase the symptoms of intra-cranial irritation.

From what has been stated, the following general conclusions may be drawn:—

1. Simple fracture of the vault of the skull may give rise to a collection under the scalp of the cerebro-spinal fluid; coming, it may be, only from an opened ventricular cavity.

2. Such traumatic cephalhydrocele may be developed quickly, or only after the lapse of a number of days or even weeks.

3. The condition is one that has thus far been noticed only in young subjects.

4. The accident is quite likely to prove fatal from lepto-meningitis or meningo-encephalitis.

5. Operative interference should be restricted to the removal by aspiration of a limited amount of fluid; and such aspiration should be made only when severe pressure symptoms have manifested themselves.

6. A similar fluid accumulation may occur after closure of the external wound of a compound vault-fracture or of a trephining.

ARTICLE VIII.

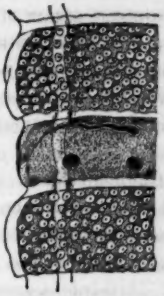
OCCURRENCE OF A RARE HUMAN TAPEWORM (TÆNIA FLAVOPUNCTATA).

By JOSEPH LEIDY, M.D., Professor of Anatomy in the University of Pennsylvania.

RECENTLY, Prof. William Pepper sent to the writer for examination some little tapeworms, which were reported to have been expelled from a child of three years of age, after the administration of santonin. Dr. T. V. Crandall, in whose practice the case occurred, informs us that the child, a boy, of German parentage, born in Philadelphia, had been weaned at twenty months, and since had partaken of the ordinary articles of food. The mother had previously noticed the passage of worms from the child, which led her to apply to the physician for treatment. Since then, nothing further has been learned respecting the condition of the patient.

The specimens consist of a dozen fragments, apparently of three tapeworms, which reached the length of about a foot to fifteen inches or more. Unfortunately, from all the fragments the head has been torn away and lost, though several delicate pieces were certainly close to the neck. The anterior part of the body is greatly attenuated, thread-like, and only about one-tenth of a millimetre in diameter where most delicate. The widest part of the body posteriorly, where the joints are mature, is two and a quarter millimetres in diameter. In their present condition, the specimens, preserved in alcohol, are of a cream colour generally, but mature

portions are pale brownish, due to the colour of the contained eggs. The joints, or proglottides, are proportionately short; in all cases the breadth exceeding the length several times. They are transversely linear, slightly widest back of the middle, with the posterior angles rounded, and the posterior margin slightly but irregularly crenate. The anterior immature joints exhibit no distinct traces of interior organs, while succeeding ones have a more coarsely granular appearance due to the presence of immature eggs. The pair of longitudinal vessels common to all tapeworms are conspicuously visible in the fragments. At the posterior part of the body, the joints in a ripe condition are of a pale brown colour, due to the contained eggs. The ripe joints do not form an unbroken series, but are interrupted here and there by a variable number, one or more, of sterile joints. (See the accompanying figure.) The ripe joints are larger than the others—longer, broader, and thicker. The anterior few are paler, and the eggs within less well developed. The eggs distend the joints, and appear to be diffused throughout a simple cavity bounded by the thin parietes of the joints, and not inclosed in ramified or dendritic uterine pouches as in most tapeworms.



One-half of two fertile joints filled with mature eggs; with that of an intervening sterile joint. Magnified 20 diameters.

The accumulation of eggs in the joints conceals everything else from view, so that the arrangement of the different parts of the generative apparatus could not be determined. In the contiguous joints, devoid of eggs, generally there is to be seen a narrow clavate organ, which I suspect to be the seminal receptacle. It occupies the forepart of one side of the joints, commencing with its thick end near the median line, and proceeding outwardly, somewhat tortuous and tapering, along the anterior border of the joints. After passing the longitudinal vessel, the tubular prolongation of the organ curves backward and outward to the aperture of the genital apparatus. Besides the clavate pouch, and diffused granular matter, the joints devoid of eggs exhibit, scattered here and there, usually from two to four or five rounded or oval bodies, which I have supposed to be testicular. The genital apertures, generally not observed except in those joints which presented the supposed seminal receptacles, are situated on one side of the body, at the lateral margin of the joints immediately behind the middle.

The longest fragment of the specimens under consideration measures thirteen inches, and appears to comprise a nearly complete worm. The anterior attenuated extremity, distinctly jointed, contains twelve joints in the length of one-tenth of an inch; and these joints measure 0.625 mm.

in width. An inch from the posterior extremity, the joints are about half a millimetre long, by two and a quarter millimetres wide, and subsequently they narrow to about two millimetres. The first ripe joint, or that containing mature eggs, is the eleventh from the last. Then succeed four white joints, or such as do not exhibit eggs within; then two brown joints, filled with mature eggs; then two white or sterile joints; then a brown one; and lastly a white one.

Several of the most delicate fragments, which may in part or all have pertained to the same individual, as the long one just described, are as follows:—

A fragment of an inch in length, thread-like, and distinctly jointed, has the joints 0.2 mm. long, by 0.625 mm. broad. A fragment of three-fourths of an inch, less distinctly jointed, has the joints 0.125 mm. long, with those at the fore part 0.15 mm. wide, and those behind 0.375 mm. wide. A third fragment of one-fourth of an inch, apparently from the neck, and in part obscurely jointed, is only one-tenth of a millimetre in width.

A fragment from the posterior part of the body, three and a quarter inches in length, has the joints half a millimetre long, and two and a quarter milimetres wide at the fore part, and three-fourths of a millimetre long with the same width as before, at the back part. The joints of this fragment, as relates to the absence or presence of mature eggs, indicated by the white and brown colour, are as follows: commencing with 2 white, 1 brown, and then successively 2, 1, 6, 1, 1, 1, 5, 1, 18, 1, 3, 1, 3, 5, 1, 1, 3, 4, 1, 1, 3, 1, 1, 5, 2, 7, 1, 10, 1, 6, 3, 3, 1, 5, 1, 2, 2, 2, 2. The anterior five of the brown joints are paler than those succeeding, from the eggs being less developed and coloured. In all the other brown segments the eggs are mature and contain six hooked embryos. Of three segments together, of which the first and last are distended with eggs, and the intermediate one is devoid of these and is white, the former are 0.675 mm. long, by 2.125 mm. wide, while the latter is 0.5 mm. long by 2 mm. wide. (The accompanying figure represents the one-half of these three segments, magnified 20 diameters.)

In a fragment of seven inches from the fore part of the body, evidently from another individual than the longer specimen above described, none of the joints are ripe. The anterior joints are 0.45 mm. long by one millimetre wide; the posterior joints are 0.625 mm. long by 1.625 mm. wide. Of the last ten joints, the first, eighth, and last exhibited immature eggs.

In another fragment of four inches with no ripe joints those in advance are 0.375 mm. long by 1.25 mm. wide, and those behind 0.75 mm. long by 2.25 mm. wide.

A posterior fragment of four inches has a few of the back joints with mature eggs. The anterior joints measure 0.45 mm. long by 1.875 mm. wide. Of the posterior joints, two brown ones distended with eggs

measure 0.7 mm. long by 2.25 wide, while an intervening sterile joint is 0.5 mm. long by 2.075 mm. wide, and a succeeding one in the same condition is 0.55 mm. long by 2.125 mm. wide. The first mature segment is the twenty-ninth from the last, then succeed three sterile joints, then a mature one, then in the order 1, 1, 12, 5, 3, 1, 1. Another posterior fragment of five inches has most of the joints brown or ripe and occupied with mature eggs, but here and there the series is interrupted by one or two joints devoid of eggs. The anterior joints measure 0.675 mm. long by 1.625 wide; the posterior 0.825 mm. long by 1.75 mm. wide.

The mature eggs are raw sienna-coloured and mostly spherical, and usually measure 0.072 mm. in diameter. A few oval eggs measure 0.08 mm. by 0.072 mm. The inclosed embryos are oval, and measure 0.04 by 0.032 mm. They are provided with six hooks arranged in three pairs.

Very different from the common species of tapeworms which infest man, the specimens under consideration appear to me to sufficiently approximate the description of *Tænia flavopunctata* as to render it probable they may belong to this species. This has been but once previously seen and recognized, and was first described in 1858 by Dr. Weinland (*An Essay on the Tapeworms of Man*, p. 49, Cambridge), from specimens preserved in the museum of the Medical Improvement Society of Boston.

They were discharged from a healthy infant of nineteen months, and consisted of fragments without the head. The length of the worm was estimated to be from eight to twelve inches. Some of the pieces consisted of young joints one-fifth of a millimetre long by one to one and a quarter millimetre broad. Other pieces at their forepart consisted of white immature joints from one-third to half a millimetre long by one and a half to two millimetres broad; while mature joints at the back part were of a grayish hue, and measured one millimetre long by one and a half to two millimetres broad. At the middle of the joints was a yellowish spot, which was viewed by Dr. Weinland as due to the testicle, and from it the species was named. Dr. Weinland remarks that the configuration of the uterus differs greatly from that in other tapeworms. He says there is no main stem in the midst with lateral branches as in the latter, but, on the contrary, the eggs are crowded over the whole joint. The eggs as described are globular, and measure 0.054 mm.

Prof. Leuckart (*Die Menschlichen Parasiten*, Leipzig, 1863, 397), who received a fragment of the *Tænia flavopunctata* from Dr. Weinland, says of it, that the joints had lost their yellow spot, and the mature joints were brownish-gray, due to the eggs. He observes that the uterus is a simple broad cavity, nearly coextensive with the joints. The size of the eggs he gives as 0.06 mm.

In most respects our specimens accord with the description of *Tænia flavopunctata*. In the size of the worms and in construction they are nearly alike. In ours the joints are slightly shorter and wider, and none

exhibit the yellow spot ascribed to *T. flavopunctata*. The latter character is inconstant, for it had disappeared in the specimen examined by Prof. Leuckart. The conformation of the uterus is the same in our specimens as in those of *T. flavopunctata*; and the peculiar condition I have described of the series of mature joints being here and there interrupted by sterile ones, has also been indicated both by Weinland and Leuckart as occurring in *T. flavopunctata*. The appearance of this alternation of fertile and sterile joints, represented in figure 117 of Leuckart, is the same in our specimens, as may be seen by comparing the figure accompanying the present communication. In our specimens the mature eggs are considerably larger than the measurements given of those of *T. flavopunctata*. The figure referred to of Leuckart represents the seminal receptacles as much larger and more conspicuous than they appear in any of our specimens, but this I suspect to be a variable character. Under the circumstances I am disposed to view our specimens as also pertaining to *T. flavopunctata*, leaving it to further opportunities of investigation to determine the correctness of my view.

If our specimens may then be regarded as belonging to *T. flavopunctata*, it is the second time the species has been observed, in both cases in this country and infesting children. It is not improbable that the species is more common than the observations would warrant us in believing, for from the smallness of the worm and the generally prevailing ignorance of the distinctions in the more common species, it might readily be passed for immature portions of these.

ARTICLE IX.

CORTICAL LESIONS OF THE BRAIN. A COLLECTION AND ANALYSIS OF THE AMERICAN CASES OF LOCALIZED CEREBRAL DISEASE.

By M. ALLEN STARR, A.M., M.D., Attending Physician, New York Dispensary; Assistant in New York Polyclinic, Department of Nervous Diseases.

IN a former paper upon the subject of localization[1] cases of lesion of the frontal, temporal, occipital, and parietal regions were considered. It was found that disease of the frontal region, though sometimes latent, produced in many cases mental symptoms of various kinds which were to be traced to a lack of self-control; that disease of the temporo-sphenoidal region caused deafness in the opposite ear with loss of auditory memories; and possibly some disturbance of the sense of smell; that disease of the occipital lobes produced blindness and loss of memory of objects recognized by sight, the blindness being in one-half of both eyes when one occipital

[1] American Journal of the Medical Sciences, April, 1884.

lobe alone was affected; and that lesions of the parietal region, while occasionally producing a disturbance of general sensation, were not known to cause uniformly any definite local symptoms.

V. CENTRAL REGION.

Lesions of the central region, including the anterior and posterior central convolutions and the island of Reil, present many well-marked local symptoms, and therefore have been more frequently recorded and more throughly studied than any others. It was to this region that attention was first called by the experiments of Fritsch and Hitzig, and of Ferrier. It is to this region that the investigations of Charcot have been chiefly directed. It is concerning this region that new facts have been brought out by this collection of cases.

The most prominent symptom produced by disease in the central region is disturbance of motion, either spasm or paralysis. Hence it has received the name of the motor area. In the following collection of cases the extent of the paralysis has been made the basis of classification, and an attempt has been made to connect various divisions of the motor area with various forms of paralysis. But a review of these cases has proved that disturbance of motion is not the only direct local symptom of disease of the central convolutions, and although the importance of other symptoms has led to their separate mention and analysis after the consideration of the cases, it should be noticed in advance that in many cases disturbance of sensation was also present.

The cases of paralysis of a single group of muscles will first be given.

CASE LI. *Facial Monoplegia.*—Male, æt. 73, had a constant twitching of the left angle of the mouth due to spasm of the zygomatic muscles, for thirty months before his death. In the interval between the spasms the muscles were paretic. No other symptoms.

Autopsy.—On the surface of the right anterior central convolution, in its lower third, a nodule of calcareous degeneration, half as thick as the gray cortex, was found, which had been caused by embolism of a minute artery.[1] (Berkley, *Medical News*, July 15, 1882.)

CASE LII. *Facial Monoplegia.*—Male, æt. 58, suffered for three months from paralysis of the left side of the face, the upper branch of the vii. n. escaping. The tongue did not deviate, and there was no aphasia. The special senses were normal, but general sensibility was impaired throughout the body. His mental faculties were sluggish. A week before his death partial left hemiplegia developed suddenly, without aphasia.

Autopsy.—On the surface of the right hemisphere two areas of softening from embolism were found. The first was old and yellow, and involved the anterior central convolution at the junction of its lower and middle thirds, in the gray matter. The second was more recent and red, and involved the angular gyrus and the posterior part of the first temporal convolution. A third area of softening of small size was found on the surface of the right hemisphere of the cerebellum. The pons showed evidence of commencing sclerosis—(not located). (J. Guiteras, *Phila. Med. Times*, ix. 25.)

[1] In all the cases here recorded it is to be understood, unless otherwise stated, that there was no meningitis, and that all other parts of the brain except those mentioned were in a normal condition.

The facial paralysis was due to the disease in the central convolution. The second lesion may have caused the disturbance of sensation as a similarly located lesion did in Case XXXIV. already described.

CASE LIII. *Facial Monoplegia.*—Male, æt. 30, suffered for three years from frequent spasms of the right side of the face, and occasional general convulsions. Then paresis of the right side of the face and motor aphasia, without affection of the tongue, developed. At this time his vision was defective, and choked disks were found. Under specific treatment, kept up six months, his speech returned and his vision improved, but the facial spasms and paralysis continued. Then convulsions of the entire right side with aphasia suddenly commenced, were repeated daily for two weeks, became general, and in the course of a month the patient died. Sensation not tested.

Autopsy.—A gumma was found in the dura mater which was adherent to the brain tissue in the left Sylvian region. It had compressed and softened the gray matter of the third frontal, both the central convolutions in their lower third, and the upper margin of the first temporal convolution. The island of Reil escaped. (J. C. Mackenzie, *Cincinnati Lancet and Clinic*, iv. 143.)

Since lesions of the frontal and temporal convolutions alone do not produce paralysis, the facial monoplegia must be connected with the destruction of the central convolutions. In this case then, as well as in the other two cases of facial monoplegia, the *paralysis of the face was a direct local symptom of a lesion lying in the lower third of the central region.*

CASE LIV. *Laryngeal Monoplegia.*—Female, had a sudden attack of complete paralysis of the left side which passed away in the course of a few weeks, leaving only a peculiar want of proper voluntary control over the muscles of the throat and larynx so that she could not govern the tones of her voice. This remained as the only permanent symptom of her attack for a year and a half, during which time, however, she had occasional epileptic convulsions. She then had an attack of complete right hemiplegia with loss of sensation and aphasia, and died in two weeks.

Autopsy.—Two symmetrically situated areas of softening were found, each of which involved the posterior extremity of the third frontal convolution and the anterior half of the island of Reil. That on the left side was red and of recent occurrence, and was due to embolism of the anterior branch of the middle cerebral artery. That on the right was old and yellow. (E. C. Seguin, *Trans. Amer. Neuro. Assoc.*, 1877.)

The direct local symptom of the old limited lesion was the laryngeal paralysis, which alone remained after the first attack. The indirect local symptoms of hemiplegia due to the shock or to a temporary widespread disturbance of circulation passed off after the first attack, but caused death after the second. This case illustrates the importance of distinguishing direct from indirect local symptoms, and proves that it is only from cases of considerable duration that accurate conclusions can be drawn.

CASE LV. *Brachial Monoplegia.*—Male, æt. 26, after a blow on the right side of the head, developed paralysis of the extensors of the left wrist and fingers, and severe headache, and gradually sank into a state of mental hebetude. Specific treatment failing, and the temperature curve showing an evening rise to 102°, abscess was suspected, and ten weeks after the injury he was trephined, being at the time in a condition of stupor and insensitive to pain. The fenestrum was made over the middle third of the right posterior central convolution, an abscess was found in the brain, and two ounces of pus were evacuated; but the patient did not recover.

Autopsy.—A meningitis strictly limited to the point of injury was found, and beneath it the cavity of the abscess, which had been evacuated and was empty. The abscess had undermined the middle third of the posterior central convolution and the convolution just posterior to it, involving both gray and white matter. (L. A. Stimson, *Arch. of Med.*, April, 1881.)

CASE LVI. *Brachial Monoplegia.*—Male, æt. 34; after suffering for two months from severe headache, developed gradually total paralysis with anæsthesia of the right hand and arm. The temperature of this arm was lower than that of the other. Three days before his death, which occurred four months after the onset of the symptoms, the head was drawn to the left side.

Autopsy.—An abscess situated beneath the left parietal bosse had penetrated one inch into the brain, and had softened the surrounding tissue. At this point the dura mater was thickened and adherent. (Thos. Cock, *Amer. Jour. Med. Sci.*, Oct. 1852.)

The abscess must have involved the middle third of the posterior central convolution and the convolution of the inferior parietal lobule adjacent to it which lie beneath the parietal eminence.

CASE LVII. *Brachial Monoplegia.*—Female, æt. 60; suddenly lost the powers of speech, and of motion in the right arm. During the following year spasms of the right arm occurred occasionally, and sensibility in it was markedly diminished. The special senses were normal. Her speech never returned completely, though she used some words and could make herself understood. Her tongue was partly paralyzed, but face and leg escaped entirely. Her spirits were good, but for a time she was melancholy on religious subjects. Two general convulsions preceded her death, which was sudden.

Autopsy.—Death had been caused by a recent hemorrhage on the base of the brain. On the surface of the left hemisphere an irregular area of yellow softening, $\frac{3}{4}$ x $1\frac{3}{4}$ in. in size, apparently the seat of a former clot, to which the membranes adhered, was found. This lesion "affected chiefly the second and upper part of the third frontal convolutions and the adjacent anterior central convolution, and the lower anterior angle of the operculum." "The convolutions of the island of Reil were almost entirely effaced." (H. C. Wood, *Phila. Med. Times*, v. 470.)

In these cases the *paralysis and anæsthesia of the arm must be regarded as direct local symptoms of a lesion situated in the middle third of the central region.*

Cases of paralysis of the leg alone, due to cortical lesion, are rare, and none are to be found in American journals. In the two following cases, however, the lesion was limited to the white substance of the brain just beneath the cortex, and could have involved those fibres only which were passing to the paracentral lobule. In both these cases paralysis of the leg was the only permanent symptom.

CASE LVIII. *Crural Monoplegia.*—Male, attacked four months before death with hemiplegia, from which the arm had almost entirely recovered, while the leg remained paralyzed. Sensation not tested.

Autopsy showed the remains of an old hemorrhage near the gyrus fornicatus, in the white substance, just beneath the paracentral lobule on the side opposite to the paralysis. The white substance near it was softened. No other brain-lesion. (Putnam, Boston Soc. of Med. Sc. Report in *Bost. Med. and Surg. Jour.*, vol. cv. p. 425.)

CASE LIX. *Crural Monoplegia.*—Male, æt. 60; was suddenly attacked during sleep with paralysis of the left arm and leg and body. Sensation was not affected, and the face and tongue escaped. The arm and muscles of the body (trapezius, etc.) began to recover at once, and in a few days all voluntary motions

in them were executed perfectly, but with diminished force and rapidity. During the first two days he passed his urine involuntarily. The leg remained paralyzed from the hip down for 17 days, when he recovered power to flex the great toe, and from that time until his death (which occurred 58 days after the attack and was caused by nephritis), a slight improvement took place in the power of the limb. There was no tremor or spasm of the limb at any time.

Autopsy.—Pia mater opaque and œdematous over both hemispheres. A clot was found, one inch in antero-posterior diameter, in the white substance of the right hemisphere adjacent to the gyrus fornicatus at the level of the anterior central convolution, just below the paracentral lobule, and above the lateral ventricle and nucleus caudatus. (F. Miles, *Arch. of Med.*, Aug. 1879.)

The following example of atrophy of the brain after amputation may be added to these cases:—

CASE LX.—An autopsy held upon a patient whose leg had been cut off twenty years before showed an atrophy of the central convolutions, paracentral lobule, and portions of the hemisphere posterior to the central fissure on the side opposite to the amputation. (C. K. Mills, Review of Charcot's Lectures, *Amer. Jour. Med. Sci.*, July, 1879.)

Lesions in the central region are usually of such extent as to involve at once the motor areas for the arm and leg, or for the arm and face. No line of demarcation can be drawn rigidly between the areas of face, arm, and leg, as the cases of associated monoplegiæ now to be considered demonstrate. But, on the other hand, the fact that paralyses of the face and leg are *never* associated when the arm escapes, is sufficient proof that the motor centres are not scattered indefinitely over the central region, but preserve the general arrangement which the cases of monoplegia just cited indicate, viz., the centres for the face in the lower third, for the arm in the middle third, for the leg in the upper third of the central region. In the following cases the lesion involved two of these areas together, and the symptoms were paralysis and anæsthesia of the face and arm, or of the arm and leg:—

CASE LXI. *Associated Monoplegiæ, Face and Arm.*—Female, æt. 39; began to suffer from epilepsy two weeks after a blow on the left parietal region. The fits were preceded by formication in the right hand and tongue, and began with spasm in the right hand, which was weak for some hours afterward. A permanent right facial paresis developed one month after the blow, and two months later the tongue, arm, and hand were also paretic on the right side. Disturbance of vision due to choked disks had developed, and temporary attacks of aphasia occurred after the frequent convulsions. She sank into a condition of stupor and aphasia four months after the first symptoms. The skull was then trephined at the seat of the old injury, in hopes of evacuating a chronic abscess, but no pus was found. One week after this she died.

Autopsy.—No meningitis. A gumma 1 inch in diameter was found on the surface of the left hemisphere, at the junction of the middle and lower thirds of the posterior central convolution, and involving also the convolution posterior to this. The membranes were adherent to the gumma. (H. B. Sands, *Medical News*, April 28, 1883.)

In this case the motor areas for the face and arm were both involved in the lesion, and the paralysis was limited to the face and arm and did not extend to the leg. Sensory irritation preceded the fits, but no mention of the condition of sensation is made.

In the following cases the arm and leg were associated in the paralysis:—

CASE LXII. *Associated Monoplegiæ, Arm and Leg.*—Male, æt. 35, had epileptic fits for two years before his death. Occasionally the spasms began in the left half of the face and extended to the arm and leg, but did not become general. After such attacks sensation was lost in the left arm, and the arm was paretic for some hours. Toward the close of life the paresis became permanent, and extended from the arm to the leg, and sensibility was somewhat impaired in these limbs. The temperature was $\frac{1}{5}$° Fahr. higher over the right parietal eminence than over the left.

Autopsy.—A gumma arising from the membranes, 2 in. in diameter but very thin, was found upon the surface of the right hemisphere. It involved the gray matter of the posterior extremities of the first and second frontal convolutions, the upper and middle thirds of the anterior central convolution, and the adjacent border of the posterior central convolution. (F. H. Martin, *Chicago Med. Jour. and Exam.*, vol. xlvi. 21.)

CASE LXIII. *Associated Monoplegiæ, Arm and Leg.*—Female, æt. 42; had been subject to headaches for a long time. In Jan. 1882, began to lose power in her right hand and arm, and by the middle of Feb. was totally paralyzed in these parts. She then had a general convulsion, and, on recovering consciousness, was found to be completely paralyzed in the right side—face, arm, and leg being affected, and there being some difficulty in talking, but no true aphasia. Her mind was clear. During the next few weeks the paralysis of the face disappeared, and power was recovered partially in the leg. The arm and hand remained powerless and became contractured. A gradual decline in strength followed; her mind became dull, she vomited frequently, and had involuntary evacuations; and towards the close she had several general convulsions. She died comatose April 11th.

Autopsy.—Two tumours (gliomata) were found, each of the size of a walnut, reddish-brown, and soft. The first was situated at the summit of the anterior central convolution of the left hemisphere, and had involved both the gray cortex and the white substance beneath it. The gray cortex about it was swollen and gelatinous. The posterior central convolution was pushed back by the tumour. The second tumour lay in the white substance of the hemisphere just beneath and posterior to the first, its lower border nearly reaching the roof of the lateral ventricle. (W. S. Cheesman, *Arch. of Med.*, June, 1882.)

CASE LXIV. *Associated Monoplegiæ, Arm and Leg.*—Male, æt. 36; was suddenly attacked with headache, vertigo, and a spasm of the left arm, which continued several hours, during which his mind was confused, but he could talk. At the same time, his left leg felt weak and his gait was unsteady. After the spasm paresis of the left arm and leg remained, and headache and vertigo troubled him frequently. During the third week anæsthesia and impairment of co-ordination developed in the paralyzed limbs, and finally became total. Vision was then impaired, he became stupid, the paralysis increased, a bed-sore developed over the left trochanter, and at the end of six weeks from the first attack he died.

Autopsy.—The membranes were adherent to the brain over an area of the right hemisphere bounded in front by the fissure of Rolando, behind by the parieto-occipital fissure, and externally by the interparietal fissure. In this area the gray cortex was softened, red, and dotted by capillary hemorrhages. The white matter beneath it was also involved, but the basal ganglia were normal. Vegetations were found on the mitral valve, but no embolus was discovered. (Wm. Carson, *American Practitioner*, vol. xv. 217.)

CASE LXV. *Associated Monoplegiæ, Arm and Leg.*—Male, æt. 17; after suffering from headache for eight months began to have general convulsions with loss of consciousness. Neuro-retinitis then developed, terminating in total blindness in a few months. Spasms and paresis of the left arm and leg, increasing to total paralysis, were present during the last four months of his life. During the latter part of this time his mind failed; he was delirious, and did not control his sphincters. His illness extended over a period of two years.

Autopsy.—A cystic tumour ("neuro-glioma") occupied the centrum ovale of the right hemisphere invading deeply the frontal lobe, and implicating the upper half of the central region, both the white and gray matter of the convolutions being involved. (L. Connor, *Detroit Lancet*, vol. v. 525.)

CASE LXVI. *Associated Monoplegiæ, Arm and Leg.*—Male, æt. 13; began to suffer, two weeks after a fall, from headache, weakness in the left arm and leg, and internal strabismus of the left eye. Soon after vomiting occurred without relation to meals, and twitching of the muscles of the left shoulder, arm, and hand began. Dimness of vision due to choked disks developed in the fourth month, and six weeks after he was totally blind. Being examined at this time by Dr. Janeway, it was found that smell was impaired in the right nostril; hearing was reduced one-half in the left ear; motions in the left arm and leg were slow, stiff, uncertain, and weak; sensibility was intact, but he suffered from pain in the left leg; the face was not affected. During the next eight months these symptoms increased in severity, but no new ones were added. He then died.

Autopsy.—Membranes normal, convolutions flattened. A portion of a tumour appeared in the right posterior central convolution near the longitudinal fissure, while the central half of the convolution was cyst-like from softening. On section, the tumour was found to affect the anterior and posterior central convolutions, especially the latter in its upper two-thirds, the posterior extremity of the first frontal, and the gyrus fornicatus, the paracentral lobule, and the anterior part of the præcuneus. It was lobular, firm, gray, of the size of an orange, and was a glioma. The brain about it was softened. The lateral ventricles contained much serum. Optic nerves were atrophied. (E. G. Janeway, *N. Y. Acad. of Med. Trans.*, vol. iii. p. 184.)

CASE LXVII. *Associated Monoplegiæ, Arm and Leg.*—Female, æt. 20; contracted syphilis December 20th, and was admitted to Bellevue Hospital January 7th, when it was noticed that she had paresis of the right arm and leg, and shuffled in walking. There was an abscess of the scalp over the left parietal bosse, which was opened and dressed. The hemiplegia gradually increased; headache, vomiting, and exhaustion occurred; the patient became stupid, and then comatose, and died January 30th.

Autopsy.—Beneath the abscess on the scalp the parietal bone was eroded, and the dura and periosteum communicated through a small perforation of the cranium. The dura was inflamed at this point, and the brain beneath it was greenish and fluctuating. Incision into it revealed the presence of an abscess containing three ounces of pus. Other parts of the brain were healthy. (J. R. Wood, *N. Y. Path. Soc. Trans.*, vol. i. p. 13.)

The lesion must have involved the middle third of the posterior central convolution and the upper part of the inferior parietal lobule which lie beneath the parietal bosse.

CASE LXVIII. *Associated Monoplegiæ, Arm and Leg.*—Female 54; suffered from right hemiplegia without affection of the face or tongue, and without aphasia. The paralysis of the leg gradually passed off until she could walk alone, and that of the arm improved slightly, it being possible for the patient to move the elbow and fingers.

Autopsy.—A small area of softening was found in the left anterior central convolution, about one inch in diameter, just at the junction of the middle and upper thirds. The softening extended inward through the white substance to the roof of the lateral ventricle. (E. C. Seguin, *Trans. Amer. Neurol. Assoc.*, 1877. Case 5.)

CASE LXIX. *Associated Monoplegiæ, Arm and Leg.*—Female, æt. 2½; after a general convulsion was found paralyzed in the right arm and leg, the latter being rigid. A loss of sensation gradually developed in both arm and leg. General symptoms of cerebral abscess appeared, and in about three weeks the child became comatose and died.

Autopsy.—An abscess of the size of an English walnut was found in the left parietal lobe of the brain surrounded by a softened area. It was visible on the surface at a point 1½ inches external to the longitudinal fissure. It had ruptured

into the lateral ventricle. It involved the gray cortex and the white substance beneath. (J. L. Smith, *Journ. Ment. and Nerv. Dis.*, July, 1880.)

CASE LXX. *Associated Monoplegiæ, Arm and Leg.*—Male, æt. 54; after suffering for three months from paræsthesiæ and daily spasms in the right hand and arm, suddenly developed marked paresis and loss of sensation in both right extremities, which gradually increased to complete paralysis, after which the spasms ceased. There followed a gradual failure of the mental faculties and of the special senses, but he was never aphasic. He died six months after the onset of the symptoms.

Autopsy.—An abscess consisting of three distinct cysts each filled with pus and red serum was found in the upper part of the central region, and over this the membranes were adherent. The size of the abscess was about that of a hen's egg, and the brain about it was softened. The ventricles and basal ganglia were normal. (F. W. Page, *Medical and Surgical Reporter*, vol. xxi. p. 29.)

CASE LXXI. *Associated Monoplegiæ, Arm and Leg.*—Male; was struck by a spent musket ball on the left parietal bone July 21st. On the 24th he came to the hospital suffering from headache and mental irritability, and two days after loss of sensibility developed in the right hand and arm, and extended gradually to the right leg. On the 30th he lost the power of motion in these limbs, and the hemiplegia increased until August 10th, when he became comatose. Four days afterwards he died.

Autopsy.—Under the scalp wound, which was three inches above the left auditory meatus, the membranes were adherent to the bone and to the brain, and just beneath them an abscess of the size of an English walnut was found. It was surrounded by softened brain tissue in which capillary hemorrhages were seen. In the middle fossa of the skull an old thin clot was found, over which the dura was thickened. (Lidell, *Amer. Journ. Med. Sci.*, July, 1883, p. 36.)

The abscess probably involved the middle third of the posterior convolution and the adjacent inferior parietal lobule. This case is typical of many to be found in the Surgical History of the War, from which it is taken. The location of the lesion in all these cases is too indefinite to warrant their citation here.

These cases are classed together, for in all of them the arm and leg were both paralyzed, and the paralysis either began or was more complete in the arm. The lesion in all the cases involved the upper half of the central region, thus lying in the areas which a study of the cases of monoplegia has shown to be motor areas for the arm and leg. When the lesion involved the central convolutions to a greater extent than the paracentral lobule, in which these convolutions join, the symptoms were more marked in the arm than in the leg. When, however, as in the following cases, the paracentral lobule was the part chiefly implicated, the paralysis was greater in degree in the leg.

CASE LXXII. *Associated Monoplegiæ, Leg and Arm.*—Female, æt. 38, syphilitic, after a blow on the head suffered from headache, vertigo, and vomiting, and then began to have left unilateral spasms beginning in the toes and foot and extending up to the arm. The spasms were followed by a partial paralysis of the right leg and arm with hyperæsthesia of these parts. The leg was affected to a greater degree than the arm. The temperature on the right side of the head was 1.2° Fahr. higher than on the left side. Choked disks produced disturbance of vision before her death.

Autopsy.—A gumma was found adherent to the membranes of the right convexity. It pressed upon and involved the surface of the brain at the upper extremities of the central convolutions, and produced a softening of their gray matter in this region. (C. K. Mills, *Arch. of Medicine*, Aug. 1882.)

This is the only case on record in the American journals in which a lesion on one side of the brain produced paralysis of the same side of the body.[1] Such cases are accounted for by a failure of the decussation of the pyramidal tracts in the medulla—an anomaly which is sometimes present. It is unfortunate that an examination of the medulla is not recorded in this case.

CASE LXXIII. *Associated Monoplegiæ, Leg and Arm.*—Male, æt. 49; after suffering for several months from headache began to feel great fatigue in his legs after slight exertion. Then the right leg became stiff and paretic. One month afterward he began to suffer from spasms in the abdominal muscles of the right side, which extended to the right leg and arm, and recurred frequently. The face and speech were never affected, and he was conscious during the spasms. The paresis of the right leg increased slowly, and the shoulder and arm then became paralyzed, the forearm and hand escaping. His disks were found to be choked. He died suddenly three months after the beginning of the paralysis.

Autopsy.—A sarcoma was found in the paracentral lobe of the left hemisphere, and just external to it a second one of smaller size. The tumours were surrounded by a zone of vascular tissue involving the upper part of the central convolutions. (Wm. S. Cheesman, *Arch. of Medicine*, Aug. 1881.)

CASE LXXIV. *Associated Monoplegiæ, Leg and Arm.*—Male, æt. 50; after an occasional sensation of numbness in the left foot, lost sensation suddenly in the entire left leg and had a severe spasm of the leg, which extended upwards and involved the arm, when he lost consciousness. From this attack he recovered completely. After three such attacks at intervals of three months he became paralyzed in the left leg and arm, the paralysis gradually becoming complete, but never affecting the face. During the next three months left unilateral convulsions occurred frequently. Then the convulsions became general, headache became severe, though no ocular symptoms were present, and he became stupid, comatose, and died.

Autopsy.—The anterior two-thirds of the right hemisphere bulged across the median line. A tumour, ovoid in shape, 5.6 × 3.7 cm., was found in the right hemisphere. It involved the gray and white matter of the paracentral lobule and the upper half of the anterior central, and posterior part of the first frontal convolutions. It was a round cell sarcoma. (G. L. Peabody, *Arch. of Medicine*, April, 1882.)

The cases of associated monoplegiæ here collected offer decided evidence in favour of the existence of definite motor areas for each limb. When the face was affected with the arm the disease involved the lower third as well as the middle third of the central region, thus implicating the same area which was alone affected in the cases of monoplegia of the face. When the arm was affected, either alone or associated with the face or the leg, the middle third of the central region was always found diseased. When the leg was affected with the arm, the upper third as well as the middle third of the central region was found to be implicated. These facts give positive proof as to the relative position in the central region of the areas for the different limbs. The negative proof is also convincing. In no case in which the lower third escaped injury was there a facial paralysis; in no case in which the lesion spared the upper third was the leg affected; and the cases of monoplegia already considered have shown

[1] A case reported at the American Neurological Society, 1881, was a case of meningeal hemorrhage, and not of direct brain lesion.

that, when the middle third was not involved, the arm was not paralyzed. It is also to be noticed that the face and leg, whose motor areas on the cortex are separated by those of the arm, were never associated in paralysis. The same relative position of the areas is indicated by the sensory symptoms, though these were less marked and less constant than the motor disturbances. They will be considered later. From a study of these cases of monoplegia and of associated monoplegiæ, the conclusion seems to be warranted that motor areas of the face, arm, and leg lie respectively in the lower, middle, and upper thirds of the central region. This conclusion is in perfect agreement both with the results of the experiments of the physiologists, and with the deductions of various pathologists from a study of a much larger number of European cases.

It is further confirmed by the following cases, in which one entire side of the body was affected, and in which the lesion involved to some extent all of these motor areas:—

CASE LXXV. *Right Hemiplegia and Hemianæsthesia, Aphasia.*—Male, æt. 72, died of pneumonia in Bellevue Hospital. For twenty years he had been paralyzed on the entire right side, and completely aphasic. The lower part of the right half of the face, the arm, and the leg were found to be paralyzed, and markedly insensitive to touch and pain. All the deep reflexes were increased, and the arm and leg were in a condition of contracture and atrophy.

Autopsy.—Both central convolutions on the left side were entirely destroyed, their place being taken by a meshwork of loose connective tissue resembling honeycomb, the meshes of which were filled with serum. This was adherent to the pia mater and to the adjacent brain-tissue. The convolutions were destroyed to a depth of three-fourths of an inch, the island of Reil being also involved in the lesion. The basal ganglia were normal. Descending degeneration was found in the middle of the left crus, in the pons, and in the left pyramid of the medulla. It could be followed across the decussation into the cord, but this was not examined beyond the second cervical segment. The new formation was an apoplectic cyst with many subdivisions. (M. A. Starr, *Bellevue Hospital History*, 1881, unpublished.)

CASE LXXVI. *Right Hemiplegia, Aphasia.*—Male, æt. 66, was seized with right hemiplegia and aphasia eighteen months before death. The paralysis was most marked in the right arm, which was also anæsthetic, and sensibility was imperfect in the leg. This condition persisted till his death, two weeks before which he had two right unilateral convulsions. Hearing was defective, and he was irritable and emotional from the time that he was paralyzed.

Autopsy.—There was destruction by old softening of the following parts on the left side of the brain: the outer rim of the island of Reil, the posterior part of the third frontal, the lower two-thirds of both central, the upper border of the first temporal, the supra-marginal convolutions, and the upper parietal lobule. (C. K. Mills, *Phila. Med. Times*, ix. p. 246.)

CASE LXXVII. *Right Hemiplegia and Hemianæsthesia.*—Male, æt. 33, after a blow on the left parietal eminence, suffered from headache, and in a few days developed paresis of the right arm and leg. One month after the paresis had become paralysis, and anæsthesia of the right side was found. Two convulsions, each beginning on the right side, then occurred, fever and delirium developed, and after the hemiplegia had become total the patient died.

Autopsy.—An abscess 1½ by 1 inch in size was found on the surface of the brain just beneath the parietal eminence. The inner table of the skull was fractured at this point, and the membranes over the abscess were inflamed and discoloured. (Bellevue Hospital Report, *Hospital Gazette*, vi. p. 552.)

The middle third of the posterior central convolution and the adjacent inferior parietal lobule lie beneath the parietal eminence, but an abscess of such size may have involved the adjacent areas of the leg and face, as well as that of the arm.

CASE LXXVIII. *Right Hemiplegia.*—Male, æt. 45. Three and a half years before his death he had an attack of clonic spasms in his right arm, which recurred three times during the same night. Two months later he observed a slight tremor in the same arm and a gradually increasing diminution of muscular power, without disturbance of sensation. These symptoms, together with an occasional twitching of the right side of the face, increased in intensity up to the time of his admission to the hospital, March 13, 1881. At that time spasms of the right face and arm occurred every fifteen minutes, and occasionally the right leg was also involved; and there was some paresis of the entire right side. In August, 1881, the paralysis of the right arm and leg had become total, and the face was drawn to the left side. The spasms, which always began in the right arm and extended to the face and leg, now involved the left side also to some extent, but were never accompanied by loss of consciousness. The eyes were turned up and to the right, and the pupils dilated during the spasm. A spasm could be produced by pressure on the left parietal bone. On August 26th the patient became comatose and died.

Autopsy.—At a spot in the middle third of the anterior central convolution of the left hemisphere the brain was yellow and fluctuating. Incision showed the presence of a cavity 1½ in. in diameter containing some fresh blood, and an old, hard, organized blood-clot. The cavity encroached upon and undermined the posterior extremity of the second frontal convolution anteriorly, and reached the anterior border of the fissure of Rolando posteriorly. (J. O. Hirschfelder, *Pacific Medical and Surgical Journal*, Oct. 1881.)

The abscess, being 1½ inches in diameter, must have encroached upon the adjacent areas both in the lower and upper thirds of the anterior central convolution, and thus produced the extensive paralysis.

CASE LXXIX. *Left Hemiplegia and Hemianæsthesia.*—Male, suffered from general epileptic convulsions for two years, after which time the spasm was limited to the left half of the face and neck and to the left arm. Then complete left hemiplegia with loss of sensation developed, and remained until his death, which occurred one year after. He suffered much from headache, but had no neuro-retinitis.

Autopsy.—An alveolar sarcoma, of the size of a hen's egg, was found on the surface of the right hemisphere adherent to the membranes. It had compressed the posterior part of the first and second frontal, the upper half of both central convolutions, and the superior parietal lobule, the gray and white matter of these convolutions being softened and destroyed. It had depressed the roof of the lateral ventricle upon the basal ganglia, and had also compressed the longitudinal sinus. (E. C. Seguin, *Trans. Amer. Neurol. Soc.*, 1877.)

CASE LXXX. *Left Hemiplegia and Hemianæsthesia.*—Male, æt. 28, fell upon a T-shaped spike, and drove it through the upper posterior part of the right parietal bone. After its removal there was found complete loss of motion and sensation upon the left side. On the fourth day after he suffered much from pain in the left arm and leg, but when the pain subsided it was found that sensation had returned. He never recovered the power of motion. Symptoms of encephalitis set in on the ninth day, and he died soon after.

Autopsy.—The brain-substance was destroyed over an area about four inches in diameter and two inches deep, just beneath the fractured skull. (S. Cooper, *Bost. Med. and Surg. Jour.*, vol. lxxxii. p. 217.)

CASE LXXXI. *Left Hemiplegia and Hemianæsthesia.*—Female, æt. 27, suffered from constant headache and occasional general convulsions for one year, and then, after a convulsion, found that she had lost the powers of motion and

sensation in her entire left side, except the fingers. Six weeks after the fingers, too, became involved, and in ten days she became comatose and died.

Autopsy.—Over the right anterior lobe of the brain lay a tumour, which was adherent to the thickened membranes, but not to the brain. It was 1½ inches in diameter, and "was imbedded in the upper and outer part of the right hemisphere corresponding to the middle portion of the corpus striatum, indenting the brain 1¼ inches." It was surrounded by a layer of softened brain-tissue, but the basal ganglia were not involved. It was a spindle-cell sarcoma. (Bell, Phila. Path. Soc. Proceedings, vol. iii., *Amer. Jour. Med. Sci.*, July, 1870.)

CASE LXXXII. *Left Hemiplegia.*—Male, æt. 40, had had two attacks of paralysis of the left side, from both of which he had partially recovered in a few weeks. In both the face and arm were more affected than the leg. He entered the hospital suffering from chronic nephritis. Examination showed paresis of the lower half of the left side of the face, slight paresis of the left arm, though he could elevate it and perform all movements, but not vigorously, and very slight paresis of the left leg. There were no contractures, no loss of sensation, and no interference with the special senses. Soon after admission he had two spasmodic seizures, each lasting one minute; in one the lower part of the left side of the face was involved alone, in the other the face and the left arm were both convulsed. He did not lose consciousness during the seizure. He died of uræmia one week after admission.

Autopsy (19 hours post mortem).—Dura normal. Pia œdematous and congested, especially over the right hemisphere. Anterior to the fissure of Rolando on the right side was an area of softening crescentic in shape, and from three-quarters to one-quarter inch in width. It began one inch from the longitudinal fissure, at the border of the fissure of Rolando, extended forward and outward so as to involve the posterior extremity of the first and second frontal convolutions, and then bending backward to the fissure of Rolando, reached this near its inferior extremity. The inner edge of the crescentic area and its two horns were thus situated in the anterior central convolution. The portion between the inner edge of the softened area and the fissure of Rolando was unchanged. The diseased mass had invaded deeply the gray matter, and at each of its extremities had encroached on the white substance. A small cylindrical area of softened tissue reached to the median surface of the brain about one-half inch beneath the convexity. All other portions of the brain were normal. (C. K. Mills, *Phila. Med. Times*, vol. ix. p. 246.)

Here portions of all three areas were involved to a slight extent, and paresis of face, arm, and leg on the opposite side was present.

CASE LXXXIII. *Cerebral Paraplegia—Aphasia.*—Male, æt. 4. When two months old the child had a fall and struck his head, but did not become unconscious. Two weeks after it was noticed that the child did not use its hands, and that there was a flexion of the forearm on the arm and of the fingers on the palm. Soon after he began to lose the use of his legs, and began to have some difficulty in swallowing. One year after, general convulsions began to occur, and one severe attack lasted two days, during which time thirty-two convulsions occurred. Two years after this attack the convulsions recurred, but were limited to the face and eyes. The child was examined when he was 3½ years old. There was marked paralysis with contracture and atrophy of all the extremities, most marked, however, in the right arm. The reflexes were exaggerated, the faradic reaction was diminished but present. The child had never spoken a word, and could not masticate food. He had not the appearance of an idiot, but was very feeble. He died six months after.

Autopsy.—On the left side of the brain from the fissure of Sylvius upward, along the fissure of Rolando and extending laterally over the adjoining convolutions, in an ill-defined manner, were evidences of chronic cerebro-meningitis. On the right side in the same region similar alterations were seen, but not as marked or as extensive as on the left side. (L. C. Gray, *Annals of the Anat. and Surg. Soc.*, vol. ii. p. 275.)

These cases of complete hemiplegia, due to extensive destruction of the central convolutions in *all* their parts, furnish further demonstration of the motor functions of this area of the cortex. They support in all respects the conclusions reached from the consideration of the cases of monoplegia, and associated monoplegiæ, for here all of the distinct areas for face, arm, and leg were involved together, and the paralysis included all of these parts in its extent.[1]

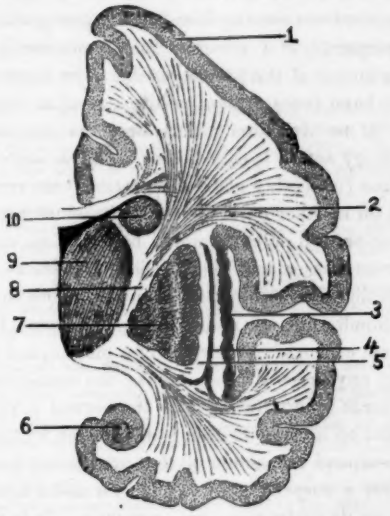
Another class of cases remains to be considered which requires a word of explanation to make clear its bearing upon the question of localization. These are the cases in which a lesion limited to *a portion* of the motor area produced a *complete* hemiplegia. If the lower third of the central region governs only the movements of the face, it may seem strange to find a lesion in this region causing also paralysis of the arm and leg—and the fact that such a lesion produces such extensive paralysis may appear to overthrow the conclusion that definite areas of the cortex are to be brought into functional relation with definite limbs. That such a deduction is fallacious, a consideration of some anatomical facts will prove.

(1) The arterial supply of the entire central cortical area is derived from the middle cerebral artery. This artery passes out to the island of Reil and there divides into branches which spread out over the convolutions of the island of Reil, and ramifying in the pia mater, pass upward along the various sulci, or over the central convolutions. Thus the blood destined to reach the superior third of the central region passes first over the convolutions of the middle and inferior thirds. It is well known that the anastomosis of the cerebral arteries is less extensive than that in other parts of the body. Hence a small amount of pressure upon an arterial trunk in the brain will cause more widely diffused disturbance of the circulation than elsewhere. A lesion located in the island of Reil, or in the neighbouring convolutions which lie about the fissure of Sylvius, inevitably affects to some degree the branches of the middle cerebral artery which pass through this region, and hence may at once cut off the blood-supply of the areas at some distance. As a result the lesion will produce two sets of symptoms: first, *direct local symptoms* due to the destruction of a cortical area; and secondly, *indirect local symptoms* due to a disturbance of the circulation in adjacent or distant areas. A good example of this is Case LIV. In this manner many cases in which extensive paralysis is produced by a small lesion near the island of Reil may be satisfactorily explained.

(2) The cortical areas of the brain are connected with the organs of the body by nerve fibres which pass inward and downward from the surface, and collect together in a great tract—the internal capsule—in the

[1] A localization of a motor area for the tongue as distinct from that of the face cannot be made from the American cases. Nothnagel places it at the junction of the third frontal and anterior central convolutions.

centre. It is, therefore, evident that fibres whose terminations are far apart become closely approximated as they pass inward, to the common tract. This is clearly seen in the diagram where fibres from all the areas are seen to join in the capsule. But it becomes at once evident that pressure exerted over any considerable surface of the cortex, and transmitted



Vertical Section through the Parietal Region. (After Pitres.)—1. Post. cent. conv. 2. Fibres from 1 collecting in the internal capsule, 8. 3. Island of Reil. 4. Claustrum. 5. External capsule. 6. Ammon's horn. 7. Lenticular nucleus. 8. Internal capsule. 9. Optic thalamus. 10. Nucleus caudatus.

inward, will cause a compression of nerve fibres whose origin is distant from the area directly involved. A tumour, for example, which lies in the middle third of the central region, and which depresses the surface of the brain an inch, will produce not only destruction of the area on which it lies, but also compression of the nerve fibres passing inward from the adjacent lower and upper thirds of the central region. Pressure upon nerve fibres interferes with the performance of their function. Therefore in such a case the distinction must again be made between direct and indirect local symptoms: the first due to the destruction of the cortical area, and the second due to compression of fibres from adjacent areas. In this manner many cases of extensive paralysis from a limited lesion receive an adequate explanation.

(3) Each area of the cortex is connected not only with parts of the body, but also with adjacent and with distant areas of the cortex by means of "association fibres," which pass from convolution to convolution. By this means all parts of the brain surface are related to one another. An

impulse starting in any region can therefore reach any other region in a normal brain. The separate motor areas are therefore in anatomical relation with each other and with non-motor areas. An examination of one's voluntary actions, by means of self-consciousness, will convince one that these actions are never spontaneous. They are invariably preceded by a sensory antecedent coming from without in the form of an irritation, or by a mental antecedent coming from some other portion of the brain, as a desire or purpose. If I move my hand voluntarily, it is for a purpose; and the existence of the purpose is due to an appreciation either of discomfort in the hand in its present position, or of an object to be gained by the motion. If no irritation occurs, or if no purpose for motion is present, no voluntary action is called forth.[1] As we have already shown, sensory impressions (excepting general sensations) are received, and mental operations go on in other parts of the brain which are non-motor. If an impulse, whose natural outcome would be a motion, starts from any of these parts, it must pass along the association fibres to the motor area, and there irritate the appropriate motor centres before the motion can be made. If the impulse fails to reach the motor centre, there will be no appreciation in that centre of the purpose of a motion, and hence no motion will result. But any process which breaks the connection of the motor area with other areas by interfering with the normal action of the association fibres will cut off all impulses sent to that area by these fibres. The result will be to suspend the action of that area, since no irritation to act will reach it. But a suspension of action in a motor area is the same in its manifestation as its destruction, viz., paralysis. It is therefore evident that disease in a portion of the brain may produce paralysis of another part by cutting off all impulses to that part. This is the explanation of the paralysis produced by many lesions of the white matter which are not situated in the direct course of the motor tracts. It also explains extensive paralysis caused by a small lesion of a motor area or tract which affects the white as well as the gray matter of the convolutions.

These three causes of indirect local symptoms may be made clearer by an illustration. A telegraph office may be connected by its wires with a distant place, and its apparatus may be in perfect order; but if the battery fluid is exhausted, or if a wire is cut, or if the office door is locked so that no one can get in to send a message, it is evident that no message from that office will be received at the other end of the line. The effect will

[1] We speak of will as something apart from the feeling or feelings which for the moment prevail over others; whereas it is nothing but the general name given to the special feeling that gains supremacy and determines action. Take away all sensations and emotions, and there remains no will. Excite some of these, and will, becoming possible, becomes actual only when one of them or a group of them gains predominance. Until there is a motive there is no will; that is to say, will is not an existence separate from the predominant feeling.—H. Spencer, *Prin. of Psych.*, vol. i. § 220.

be the same at that end as if the entire office and apparatus were destroyed. In like manner any of the causes here enumerated may produce a paralysis as readily as destruction of the motor area itself.[1]

The following cases of extensive paralysis occurring with a limited lesion of the motor area, instead of refuting, rather confirm the doctrine of localization when examined with these facts in view. But in considering them it is necessary to distinguish the direct local symptoms due to the destruction of one motor area from the indirect local symptoms due to incidental affection of adjacent motor areas.

CASE LXXXIV. *Right Hemiplegia, Aphasia.*—Female, æt. 75; suffered from hemiplegia of the right side, including the face, and from aphasia. There was much recovery of the power of motion so that she could use her arm somewhat, and could take a few steps without assistance. The aphasia remained until her death.

Autopsy.—An extensive area of softening was found in the surface of the left hemisphere, which involved the posterior extremity of the third frontal, the inferior extremity of the anterior central, the lower third of the posterior central, the inferior parietal, and upper edge of the first temporal convolutions, the angular gyrus, and the island of Reil. Beneath the third frontal convolution and the convolutions of the island of Reil the white matter was softened. (E. C. Seguin, *Trans. Amer. Neurol. Assoc.*, 1877. Case 1.)

The facial paralysis and aphasia were permanent, and were direct local symptoms. The other symptoms were indirect, and partly passed off.

CASE LXXXV. *Aphasia, Right Hemiplegia.*—Male, æt. 66, whose history could not be obtained, was under observation for four months, during which time he was aphasic, and had right hemiplegia with partial right hemianæsthesia. He could understand what was said, though he was deaf, but could only say a few words. The paralysis and anæsthesia were total in the arm which was contractured; the face, tongue, and leg being affected to a less extent. During the last week of his life, spasms of the paralyzed limbs occurred frequently, his face and eyes being drawn to the left at the time, and the aphasia becoming total. His sight was never disturbed. He was irritable and emotional.

Autopsy.—Pia mater œdematous and opaque over the parietal and occipital lobes. An area 1½ inches wide and ¾-inch deep seemed to have been scooped out of the left hemisphere along the fissure of Sylvius and through the inferior parietal lobule; the posterior part of the third frontal, the lower third of the two central, the supra-marginal, the upper temporal convolutions, and the outer rim of the island of Reil, with the posterior part of the superior parietal lobule, being involved in the destruction. The pia mater was thickened and adherent to the sides of the deep sulcus formed by this loss of tissue, and in it much yellowish white detritus was found. The basal ganglia were normal. (C. K. Mills, *Philadelphia Medical Bulletin*, vol. i. p. 13.)

The facial and brachial paralysis as well as the aphasia must be ascribed to the lesion. The paralysis of the leg was probably due to disturbance of circulation in the upper part of the central region.

CASE LXXXVI *Aphasia, Right Hemiplegia.*—Female, æt. 51, was suddenly seized with right hemiplegia and aphasia. She soon regained some power in the leg so that she could walk, and to a less degree the power in the arm, but the aphasia remained for six years, until her death. "She could not talk because she could not think of the words, nor could she read, write, or count."

[1] These facts illustrate the distinction between absolute and relative motor areas first drawn by Exner.

After a second attack of right hemiplegia, occurring four years after the first, there was a numbness of the right side of the body. A third attack caused her death.

Autopsy.—A depression one inch in diameter was found upon the surface of the brain on the left side, "above the termination of the fissure of Sylvius, and involving the island of Reil." It was due to an old apoplectic clot which had been partly absorbed, its place being filled with very loose connective tissue containing serous fluid in its folds. (J. G. Richardson, *Richmond Med. Jour.*, vol. iii. p. 426.)

The indirect local symptoms of paresis of the leg and arm are here easily distinguishable from the direct local symptom, aphasia, since the latter alone was permanent. A clot in this region would press upon the branches of the middle cerebral artery as they passed upward, while the rupture of one of these branches would in itself produce much disturbance of the collateral circulation in the upper central region.

CASE LXXXVII. *Right Hemiplegia, Aphasia.*—Female, æt. 41. Eighteen months before death was suddenly seized with right hemiplegia including face and tongue, and aphasia. Four months before death was examined, and found to have ataxic aphasia, *i. e.*, she could understand what was said, but could pronounce only a few words. The lower part of the right side of the face was paretic, the right arm was completely paralyzed, atrophied, and in a state of contracture in a position of flexion, passive extension being difficult and painful; the right leg was paretic, but not contractured. The faradic contractility remained. The sensation was normal. Patient had cardiac disease and phthisis, and died of exhaustion.

Autopsy (18 hrs. p. m.).—An area of yellowish-white softening was found in the left hemisphere, involving a small portion of the posterior part of the third frontal, the lower extremity of the anterior central, the upper border of the adjacent first temporal convolutions, and the entire surface of the island of Reil. The corpus striatum and optic thalamus were normal. There were no other lesions. (C. K. Mills, *Phila. Med. Times*, vol. ix. p. 245.)

CASE LXXXVIII. *Facial Spasm and Paresis, Left Hemiplegia.*—Female, æt. 47; after suffering from several general convulsions with loss of consciousness at intervals through three years, had a spasm of the muscles of the left side of the face, without loss of consciousness. This recurred every fifteen minutes, and in a week a paresis of these muscles was noticed between the spasms, and the tongue began to deviate to the left. Then the left arm became convulsed with the face, and the next day it was paralyzed. Four days after the spasms extended to the left leg, and then left hemiplegia developed. Two weeks from the time of the first spasm the entire body became involved in the convulsion, which was, however, not attended by loss of consciousness nor followed by general paralysis. No headache. No aphasia. Sensation was not tested. Disturbance of vision had been present some time. The spasms occurred at last every five minutes, and at the end of three weeks from their onset the patient died.

Autopsy.—A tubercular tumour, ¾ by ¾ inch in size, was found "in the anterior lobe of the right side exterior to the posterior lobe of the corpus striatum" (the lenticular nucleus?) "and involving a deep convolution from the surface." (M. L. Mead, *Amer. Jour. Med. Sci.*, July, 1866.)

The description refers probably to the lower third of the fissure of Rolando, whose gray floor forms a "deep convolution" opposite to the lenticular nucleus. That the area for the face was directly and primarily involved is evident from the fact that the facial spasm and paralysis preceded the other symptoms.

CASE LXXXIX. *Facial Spasm and Paralysis, Right Hemiplegia.*—Female, æt. 42; was subject to spasms of the right side of the face, which increased in frequency for three years until they occurred every few minutes. During the last year the right arm and leg participated in the convulsive movement. Consciousness was always preserved, and in the intervals between the spasms there were no symptoms. All the special senses were normal. Two days before admission to the hospital she lost consciousness during a spasm, and on recovering found her right side paralyzed. On admission the right unilateral spasms occurred every few minutes, and in the intervals there was right hemiplegia with conjugate deviation of the eyes to the left. The entire right side was hypersensitive, any touch causing pain. There was no aphasia, but her speech was thick. Pupils normal and sight good. She died three days after admission.

Autopsy.—A bulging was noticed on the surface of the left hemisphere in the lower part of the central region. On section the white matter was found to be soft and the line of the gray matter indistinct, the central convolutions in their lower third to a depth of 1½ inches being affected, as well as the posterior part of the third frontal convolution. Microscopic examination showed the softened tissue to be a glioma which had infiltrated both cortex and white matter. (Wm. S. Cheesman, *Arch. of Med.*, Aug. 1881.)

In these cases the lesion affected the facial area in the lower third of the central region and produced, as direct local symptoms, facial spasm and paralysis. It also produced spasm and paralysis of the arm and leg, which in all these cases were evidently indirect local symptoms, due to disturbance of the circulation or of the conduction of nervous impulses to adjacent areas, since they occurred *after* the direct local symptom or were *less severe* or *less permanent* than it.

The same distinction may be made in the following cases, in which the direct local symptom was an affection of the arm:—

CASE XC. *Brachial Spasm and Paralysis, Left Hemiplegia.*—Male, æt. 26, after suffering from headache for some months, was seized with a spasm, which began in the fingers of the left hand, and extended to the entire limb, and then to the left side of the face, leaving the left arm almost completely paralyzed and the left leg weak. The spasms were repeated frequently, and after one week the left side of the face and tongue was found to be paretic. When consciousness was preserved during the spasm it caused great pain in the limb. Sensation not tested. His mind was clear up to his death, but he became emotional. The headache increased in severity, and three weeks after the first spasm he became comatose and died.

Autopsy.—In the middle lobe of the right hemisphere of the brain a well-defined abscess was found, of the size of a walnut, full of fetid pus. The upper part of the abscess was near the surface, and it descended into the interior of the brain, but did not reach the ventricle. The brain around it was softened and discoloured. (W. W. Wellington, *Bost. Med. and Surg. Jour.*, vol. lxii. p. 247.)

CASE XCI. *Brachial Spasm and Paralysis, Left Hemiplegia.*—Female, æt. 30; after suffering from headache for five months had a spasm of the left arm, which began in the fingers and ended in a general convulsion, leaving the left arm and hand paralyzed. During the following six months the spasms recurred frequently, being occasionally limited to the left arm; and a partial left hemiplegia, with partial left hemi-anæsthesia developed, the symptoms being more marked in the arm. Headache, vomiting, disturbance of vision due to choked disks, deafness in the right ear, and decided mental impairment with an emotional condition preceded death.

Autopsy.—A cancer 1½ inches in diameter was found upon the cortex of the right parietal lobe. It involved the middle third of the posterior central convolution and the adjacent inferior parietal lobule. The white matter of the brain beneath it was softened. (C. K. Mills, *Arch. of Med.*, Aug. 1881.)

CASE XCII. *Brachial Spasm and Paralysis, Left Hemiplegia.*—Female, æt. 58, who had suffered from severe headache for several months, noticed a constant tremor in her left hand, and occasional spasms, which occurred several times a day, and were followed by a gradual loss of power in the arm, and finally by contracture of the flexor muscles. Paresis of the left leg, and later of the left half of the face developed, but varied much in degree, while the arm was constantly paralyzed. Sensation was impaired in the arm. Choked disks were present. Complete left hemiplegia was present six months after the first spasm, and soon after this she died.

Autopsy.—A carcinoma, of the size of a walnut, was found occupying the gray matter of the right anterior central convolution at its junction with the paracentral lobule, and pressing slightly upon the posterior central convolution. The paracentral lobule was intact, but the convolutions about the upper end of the fissure of Rolando were much flattened. The white matter beneath the cancer was involved to a depth of 20 mm. (E. C. Seguin, *Jour. Ment. and Nerv. Dis.*, July, 1881.)

In all these cases the paralyses of the face and leg are to be regarded as indirect local symptoms, while that of the arm was due directly to the lesion, whose seat was in the middle third of the central region.

CASE XCIII. *Left Hemiplegia.*—Male, æt. 53, after being subject for several years to peculiar attacks of general tremor not attended by loss of consciousness, gradually became paralyzed on the left side, and aphasic. The fingers and hand were first affected, paresis and numbness coming on together; and then his leg was involved, there being a great impairment of coördination, so that he walked with difficulty. The aphasia passed off in the course of a month, but the hemiplegia remained, being, however, incomplete. Seven months after he suddenly became comatose and died.

Autopsy.—In the right fissure of Sylvius a tubercular tumour was imbedded, 1½ inches in diameter. It had completely disorganized the convolutions of the island of Reil, and, to some extent, the upper surface of the first temporal convolution. The inferior extremities of the central convolutions were normal. (H. Leaman, *Phil. Med. News*, Jan. 27, 1883.)

This history does not state the kind of aphasia present, and the existence of a partial paralysis is left in doubt. It would also have been of interest to know whether the patient was left-handed, as in such persons lesion of the right island of Reil produces aphasia. A temporary aphasia is often associated with disease in the right island of Reil in right-handed persons, possibly, as in Case LIV., from a destruction of the motor centres of the larynx. This is, then, a dysphasia rather than an aphasia, and should be distinguished as such.

CASE XCIV. *Facial and Brachial Paralysis, Left Hemiplegia.*—Female, æt. 53, suffered from headache, and a gradually developing paralysis of the entire left side, sensation as well as motion being impaired. The arm and face were more affected than the leg. Her intellect became weak before her death, which took place seven months after the symptoms began.

Autopsy.—A glioma, adherent to the membranes, 1½ inches in diameter, had pressed upon the right hemisphere, "just anterior to the fissure of Sylvius." The brain around the tumour was softened, and posterior to it was destroyed, for a space of 1½ inches. (H. C. Wood, *Amer. Jour. Med. Sci.*, April, 1864, Phil. Path. Soc.)

Here the leg was secondarily involved, and the lesion did not extend to its motor area. In the following cases, however, the lesion affected the

paracentral lobule and the upper part of the central convolutions, and the paralysis began in or was most marked in the leg.

CASE XCV. *Crural Spasm and Paralysis, Left Hemiplegia.*—Male, æt. 54, was seized with a clonic spasm of the left lower extremity involving the toes, foot, and leg, and followed by paresis, which increased gradually, and extended upward until, after eleven months, a well-marked left hemiplegia, including the face, was present. During this time he had suffered from constant headache, worse at night; and impairment of vision; and his mind had become affected, so that he committed errors of judgment in his business, and would occasionally lose his way about the city. A swelling over the right parietal bone, which had increased slowly during several months, was found to be a syphilitic node. He was examined eleven months after the onset of the symptoms, and, in addition to the symptoms mentioned, double optic neuritis was found. There was no diplopia or strabismus. Sensation was normal. Articulation was indistinct, but there was no aphasia. He lay in a condition of stupor, but could be aroused, and would answer questions correctly. He died a little over one year after the illness began.

Autopsy.—An osteitis on the inner table of the right parietal bone had produced a bony tumour, which depressed the convolutions at the upper end of the right fissure of Rolando on both its sides, and the paracentral lobule. (E. C. Seguin, *Arch. of Med.*, vol. ii. p. 105.)

CASE XCVI. *Crural Paralysis, Left Hemiplegia.*—Male, æt. 30, noticed a weakness of the left leg, headache, and vertigo, which increased in severity, and went on to complete left hemiplegia, the face being only slightly affected. Sensation was greatly impaired in the leg and arm. Total paralysis in the arm and leg was followed by contractures. The mental faculties then became impaired, and the control of the sphincters was lost. There was no aphasia, but the attention could not be fixed on any subject. Special senses normal. Just prior to death the right leg became weak, and there occurred spasms in the right arm. He died comatose six months after the onset of the symptoms.

Autopsy.—The posterior part of the first frontal convolution and the paracentral lobule on the right side were involved by a large, irregularly shaped tumour, which projected across the longitudinal fissure, and indented the paracentral lobule of the left side. It involved the right gyrus fornicatus, as well as the parts mentioned. (E. C. Janeway, N. Y. Path. Soc., *New York Med. Record*, vol. ix. p. 651.)

CASE XCVII. *Associated Monoplegiæ becoming Hemiplegia.*—Male, æt. 34, suffered for two years from spasms of the right arm and leg, which occurred several times a week without loss of consciousness. Then paresis of these limbs developed, and he had a sudden attack of complete right hemiplegia, with difficulty of articulation. Sensation was unaffected. During the following six weeks atrophy and contracture of the paralyzed limbs developed, and his mind became weak. He then became comatose, and died.

Autopsy.—A glioma adherent to the falx cerebri lay in the left paracentral lobule, and has destroyed the cortex on its median surface. External to this tumour, and undermining the upper half of the central convolutions, was a cavity filled with red serum. The corpus callosum was depressed by the tumour, as was also the optic thalamus. The posterior extremities of the first and second frontal convolutions, as well as the gyrus fornicatus, were compressed and destroyed. (E. C. Seguin, *Jour. Ment. and Nerv. Dis.*, July, 1881.)

Here the face was not affected so long as the tumour involved only the motor areas of the leg and arm. When, however, the hemorrhage occurred in its outer part pressure was exerted upon the fibres coming from the facial area, and then the hemiplegia became complete.

To these cases are added the following, in which the direct local symptom was aphasia, and the indirect local symptom produced by disturbance of the circulation was an affection of general sensation.

CASE XCVIII. *Aphasia, Hemihyperalgesia.*—Male, æt. 43, a phthisical man, suffered during the last month of his life from intermittent attacks of aphasia and agraphia, without paralysis, but with hyperalgesia of the right half of the body. He would be aphasic for twenty-four hours, and then recover the power of speech only to lose it again. Toward the close of life the intermissions were short and incomplete.

Autopsy.—A tubercular meningitis was found limited to the left fissure of Sylvius, and to the pia over the posterior parts of the third frontal, lower third of the two central, and upper margin of the front temporal convolutions, and the convolutions of the island of Reil. (E. C. Seguin, *Trans. Amer. Neurol. Assoc.*, 1877.)

CASE XCIX. *Aphasia, Hemiparæsthesiæ.*—Female, æt. 38, suffering from tubercular phthisis, was seized three weeks before her death with a tingling sensation in the entire right side, and an inability to talk. She understood what was said to her, and was not deaf. She could pronounce words, but could not name objects or repeat words spoken by another until after several trials. She tried to talk, but used the wrong words, so that her sentences were unintelligible. She succeeded in telling her name, age, etc., after many failures. When asked simple questions she understood, but seemed bewildered at being unable to reply. No paralysis or anæsthesia. Reading and writing not tested. This condition passed off in the course of two days, but returned four days after and remained till death. Several general convulsions occurred during the last two weeks.

Autopsy.—Numerous small miliary tubercles were scattered over the surface of the brain, and on the base there was some effusion of fibrin. In the left fissure of Sylvius there was a large collection of tubercles, one nodule of the size of a pea indenting the convolutions of the island of Reil, in which a small area one-half inch in diameter was found, dark yellow, and softened. This was the only gross lesion of the brain substance. (M. A. Starr, *Bellevue Hospital History*, 1881, unpublished.)

This case was one of aphasia of incoördination, the impulse sent out from the centre where a definite word memory was stored failing to reach the corresponding centre where the motion necessary to pronounce the word should have been initiated.[1]

Analysis of the Symptoms.—I. Sufficient comment upon the paralysis produced by lesions of the central area has been made as these cases have been cited. They all lead to the same conclusions. The motor area for the face and tongue lies in the lower third of the central region. The motor area for the arm and hand lies in the middle third of the central region. The motor area for the leg and foot lies in the upper third of the central region. Each motor area is in functional relation with the corresponding limb of the opposite side. Lesions in one hemisphere therefore produce paralysis of the limbs on the other side of the body.[2]

Paralysis indicates a destruction of a motor area; spasm indicates its irritation. Hence these motor symptoms are independent of one another, and each

[1] There are but four cases in the American records which oppose the theory of localization. Of these two are reported by Amidon, *Jour. Ment. and Nerv. Dis.*, Jan. 1880; the third is by T. Deecke, *Amer. Jour. of Insanity*, xxxix. p. 441; the fourth is by N. Otis, *N. Y. Med. Jour.*, i. p. 26.

[2] Strictly speaking, each hemisphere is in functional relation with *both* sides of the body, since the decussation of the motor fibres in the medulla is not complete. Such a large majority of the motor fibres, however, pass to the opposite side, that the general statement made above is true.

furnishes distinct evidence of the location of the motor area. A review of the cases proves that the conclusions reached by a study of the cases of spasm coincide with those reached from the study of paralysis. In the cases in which spasm occurred it either was limited to one limb, or extended *in a definite manner* to other limbs. When the spasm affected the leg alone the lesion was in the upper third of the central region; when it affected the arm alone the lesion was in the middle third of the central region; when it affected the face alone the lesion was in the lower third of the central region. When the spasm began in the face and extended, it affected first the arm and then the leg; when it extended from the leg, it affected first the arm and then the face. It never extended from face to leg, or *vice versa*, without affecting the arm. This order of extension is only to be explained by the fact that the motor areas of face and leg are separated by that of the arm. It indicates clearly that the motor centres are not scattered indiscriminately over the motor area, but that they have a definite arrangement. It also indicates an arrangement similar to that already determined by a study of cases of paralysis, and thus confirms the conclusions reached from that study.

II. Until quite recently, paralysis was thought to be the chief local symptom of lesions in the central region. When Nothnagel published his work on local diagnosis of brain disease, in 1879, he wrote:[1] "Disturbances of sensation have as yet no bearing upon the diagnosis of cortical lesions." The announcement made soon afterwards independently by the physiologists Goltz,[2] Munk,[3] Moeli,[4] and Tripier,[5] that animals whose central area was extirpated showed a loss of sensation as well as of motion, excited an interest in sensory symptoms, and cases were then more carefully examined. In 1881, Exner was able to find twenty-two cases in which sensory disturbance had occurred in the course of cortical disease, and in all of these cases he found the lesion to be either within or very near the central region.[6] He was the first to draw the conclusion that in man the cortical areas for tactile sensibility and motion coincide. Since that time Tripier[7] has published seven cases, Petrina[8] has published six cases, and several other foreign authors have recorded single cases in which lesion of the central region produced anæsthesia. A review of the cases here collected confirms the conclusion of Exner in all respects. *Disturbance of sensation must be considered as one of the direct local symptoms of lesion in the central region.* It was present in more than one-half of these cases. In many of the remainder no statement of the

[1] Topische Diagnostik der Gehirnkr., p. 499, 1879.
[2] Arch. f. Phys. Pflüger, xiv.
[3] Physiol. Gesell. zu Berlin, 1879, 1880.
[4] Moeli, Virchow Arch., Bd. 76.
[5] Rev. Mensuelle de Médecine, 1880–81.
[6] In 16 of Exner's cases, the central convolutions were involved. In the remainder the parietal lobes were affected.
[7] Rev. Mensuelle de Médecine, 1880–81.
[8] Zeit. f. Heil., ii. 1881.

condition of sensation is made; and in others the examination was by no means complete, the sensations of touch, pressure, pain, temperature, and location of a limb not being separately subjected to appropriate tests.[1] It is therefore probable that the proportion of cases of lesion in the central region in which disturbance of sensation was present is much greater than that stated. Its occurrence in even one-half of the cases would warrant a careful consideration.

Disturbance of sensation may be due either to irritation or to destruction of the central region. Examples of the first are the cases in which hyperæsthesia or pain or paræsthesia occurred. Examples of the second are the cases of anæsthesia and analgesia, partial or complete. In some cases the irritation of the cortex was followed by its destruction, and then the pain and numbness were succeeded by loss of sensation. A further analysis of these cases shows the same distribution of the sensory areas as was found of the motor areas; the sensory area for the leg and arm lying in the upper and middle thirds of the central region respectively, and that for the face being located probably in the lower third, although this last conclusion is not supported by any positive case, but is reached by the method of exclusion. The arm alone was anæsthetic in four cases, and in all of these the middle third of the central region was destroyed. The leg was affected alone in one case, and in this the upper third was involved in the lesion. The arm and leg were associated in the sensory as well as in the motor symptoms in four cases, and in these both middle and upper thirds of the central region were involved, that limb being affected to a greater degree whose sensori-motor area was most implicated. In no case were face and leg affected together when the arm was not involved. Complete unilateral anæsthesia occurred in eleven cases, but, as in the occurrence of hemiplegia, a distinction between direct and indirect local symptoms is to be made before the logical conclusion can be drawn; and, as in those cases, the evidence when so weighed is directly in favour of the relative arrangement of sensory areas for face, arm, and leg in the lower, middle, and upper thirds of the central region respectively.

In seventy-five per cent. of the cases of sensory disturbance the lesion lay posterior to the fissure of Rolando, and involved the posterior central convolution. In more than a half of these the adjacent parietal lobules were also affected. If any distinction is to be made between motor and sensory areas in the central region it seems to be clear that the relative

[1] In testing sensation, compare each limb with the other three and with the face. Test touch by a light stroke with a bit of cotton-wool. Test pressure by placing books of various weights in turn on one part. Test pain by pinching or pricking. Test the muscular sense by requiring the patient to reproduce voluntarily in one limb a position given artificially to the other limb, while his eyes are closed. Test temperature by sponges wet with water at various degrees of heat or cold.

[2] Deutsch. Arch. f. klin. Med., xxxii. 3. Three cases.

position of the motor and sensory fibres in the internal capsule is preserved in their distribution in the cortex—the sensory areas lying posterior to the motor.[1] Cases have been already cited in which a lesion of the parietal lobules alone has produced partial anæsthesia of the opposite side of the body.[2] It is, therefore, probable that the sensory areas extend further backward than the motor areas, and that they include the parietal lobes in their extent to some degree.

But even if they are more extensive than the motor areas, it is evident that the two coincide to a considerable degree, since lesions of the posterior central convolution produce paralysis as well as anæsthesia, and since cases are not wanting of anæsthesia with paralysis when the lesion lay in the anterior central convolution.

Many cases of anæsthesia following a lesion of the central region have been recorded in European journals during the past two years, and the opinion seems to be growing that the failure to recognize this symptom in other cases has been due to imperfect investigation rather than to its absence. For this reason little weight can be laid upon any number of negative cases recorded prior to this time. Another explanation may, however, be offered. It has been stated that the motor area of each hemisphere is in functional relation with both sides of the body, and that the visual area of each hemisphere is in functional relation with both eyes. It is, therefore, probable that each hemisphere is in functional relation with both sides in respect also of general sensation. If this is so, it is evident that a lesion of one hemisphere may easily produce an impairment of sensation, but can never produce a total loss of sensation in one side. This impairment of sensation will affect both sides of the body, but will be greater on the side opposite the lesion, since the sensory like the motor decussation is almost complete.[3] But, this being the case, any test of sensation, unless carefully made, may fail to detect the various degrees of impairment of sensation on the two sides, and thus the symptom may escape attention. The final determination of the limits of the sensory area lies, however, in the future, when more thorough examination of every case is destined to furnish the necessary facts. It is, however, very clear that the testimony of the American cases is in favour of a localization in the central region of sensory as well as of motor functions. This conclusion is further strengthened by the fact that lesions in other regions of the cortex—the frontal, temporo-sphenoidal, and occipital—are not accompanied by disturbances of general sensation.

III. The symptom aphasia is too complex a subject for examination in the short space remaining here. As has been demonstrated by Wernicke

[1] This statement accords with that of Flechsig (Plan. des Mensch. Gehirns, 1883), reached by a study of the anatomy of the brain.

[2] Cases XX., XXXIV., LII.

[3] An example of this is afforded by Case LII.

and Kussmaul, it must be analyzed into several varieties, each of which is due to a lesion in a different part of the brain. Two of these varieties, sensory aphasia and aphasia of incoördination, have been already alluded to in considering cases of disease in the temporal and parietal regions. The third variety, motor aphasia, is illustrated by fourteen cases included in lesions of the central region. But, as in the majority of these cases, a considerable area of the central region was involved, no limitation of the function of speech to Broca's convolution can be proven. Among a large number of cases of aphasia to be found in American journals there are very few in which the lesion was strictly cortical, the basal ganglia being as a rule involved. In all of the cases of aphasia here cited the lesion was found in the left Sylvian region. The third frontal and lower central convolutions being affected in motor aphasia; the first temporal in sensory aphasia; the island of Reil and the association fibres between these convolutions in aphasia of incoördination. The American cases, therefore, oppose the French theory which limited the speech centre to the third frontal convolution; and also the statement of Exner, which extended the speech centres widely over the left hemisphere. They support the localization described by Wernicke, and accepted by German authorities. The memory of words is stored in the first temporal convolution. The memory of voluntary acts necessary to speech is stored in the third frontal and lower central convolutions. The connection between these regions necessary to turn thought into spoken language is made by fibres passing from one to the other through the island of Reil.

IV. There was an absence of any affection of the special senses in all the cases of lesion of the central region, which did not produce an increase of intracranial pressure. Where sight was affected the presence of choked disk during life, or the discovery of a tumour at the autopsy, afforded sufficient proof that the disturbance of vision was to be regarded as a general symptom of tumour, and not as a direct local symptom of disease of the central region. In the only case in which hearing was impaired the first temporal convolution was involved. Disturbance of hearing is not a symptom of an increase of intracranial pressure, as it was wanting in thirty-eight cases of tumour of the brain here collected. Nor can it be considered a symptom of lesion in the central region, since it failed in all the other cases of such lesion. It is, therefore, in this one case, to be brought into relation with the lesion of the temporal lobe, a conclusion which accords with the result of a study of lesions of that region. Smell and taste were not affected in any of these cases.

V. Mental symptoms were by no means constant in these cases, but as they occurred in about twenty-five per cent., it cannot be said that disease of the central region has no effect upon the mind. In some cases the patients were stupid, in others emotional, and in others they are described as in a condition of dementia. It has been already shown that the memory

of objects is located in those portions of the brain in which the original sensory perception of those objects has occurred; sight memories being stored in the occipital, and sound memories in the temporal lobes. We have memories of general sensations, of pain, pressure, touch, and temperature, as any one can verify by introspection. It is also possible to recall motions which have been learned by practice (*e. g.*, writing, playing an instrument, dancing), without carrying them out. We therefore have motor as well as sensory memories. It seems most probable that these motor memories are stored in the region where the original motion was first produced, viz., the central region. The cases in which patients have suddenly forgotten the motions necessary for speaking, reading aloud, or writing, and in which disease of this region has been found, go far to establish this hypothesis. A case reported by Charcot,[1] in which power of recognizing written language when seen was blotted out, but in which the patient became conscious of the meaning of a letter on tracing its form with his finger, affords proof that motor memories are independent of those of the special senses.

When the frequent recurrence of memories of voluntary acts or general sensations, in any train of thought, is considered, and also the probability that these memories are destroyed in lesions of the central region, it becomes evident that some affection of the mind is to be expected in diseases of this part of the brain. It remains for future observers to decide whether a constant affection of special memories of sensation and motion occurs in these diseases, as this would be a fact of great psychological interest and of diagnostic value.

General Conclusions.

From the analysis of the cases of cortical lesion of the brain here collected, and a review of the results reached by foreign authors, the following conclusions are drawn:—

1. Various powers of the mind are to be connected with activity in various regions of the brain; the surface of the organ being the seat of conscious mental action.

2. The highest qualities of the mind, intellect, judgment, reason, self-control, require for their normal display integrity of the entire brain, but especially of the frontal lobes. A change of disposition and character may be considered as symptomatic of disease of the brain, and, in the absence of other symptoms, of disease of the frontal lobes.

3. The power of sensory perception is distributed over the various regions of the brain with which the various sensory organs are anatomically connected. In these regions objects are not only first consciously perceived, but are also subsequently recognized; and hence it is in these

[1] Progrès Médical, April and May, 1883.

regions that the memory pictures are stored, by whose aid the act of recognition is accomplished.

(*a*) Disturbance of sight, whether in the form of actual blindness, or of failure to recognize or to remember familiar objects, or of hallucinations of vision, may indicate disease in the occipital lobes. An examination of the field of vision will indicate which lobe is affected, since blindness in the right half of both eyes may be due to destruction of the left lobe, and blindness of the left half of both eyes may be due to destruction of the right lobe.

(*b*) Disturbance of hearing, either actual deafness in one ear or hallucinations of sound on one side (voices, music, etc.), may indicate disease in the first temporal convolution of the opposite side. Failure to recognize or to remember spoken language is characteristic of disease in the first temporal convolution of the left side in right-handed persons, and of the right side in left-handed persons. Failure to recognize printed or written language has accompanied disease of the angular gyrus at the junction of the temporal and occipital regions of the left side in three foreign and in one American case.

(*c*) Disturbance of smell, either as an hallucination or as a loss of power to perceive odours, may possibly indicate disease in the temporo-sphenoidal region on the base of the brain.

(*d*) Disturbance of taste cannot, as yet, be connected with disease in any region. This is due to lack of care in testing this sense in cases of brain disease.

(*e*) Disturbance of general sensation—including the senses of touch, pressure, pain, and temperature, together with the sense of the location of a limb—may occur either in the form of subjective perceptions of such sensations without objective cause, or in the form of impairment of these sensations. In either case it indicates a disease in the central convolutions, and possibly in the adjacent portion of the parietal lobules.

4. The power of voluntary motion of the muscles of the opposite side of the body is located in the two central convolutions which border the fissure of Rolando. Motions of the face and tongue originate in the lower third of this region; motions of the arm, in the middle third; motions of the leg, in the upper third.

Spasms in a single group of muscles, or paralysis of a single group of muscles may indicate disease of its motor area. Extensive spasms or paralysis may indicate a large area of disease in this region, but if more marked in a single group of muscles than in others it may indicate a small focus of disease in the motor area of that group affecting other motor areas indirectly and coincidently. Paralysis following spasm in one group of muscles is a characteristic symptom of disease in the central region.

5. Disturbance of the power of speech indicates disease in the convolutions about the fissure of Sylvius on the left side in right-handed persons,

and on the right side in left-handed persons. If the patient can understand a question and can recall the words needed for a reply, but is unable to initiate the necessary motions involved in speaking, the disease is probably in the third frontal convolution and in the adjacent portion of the anterior central convolution. If the patient cannot recognize spoken language, but can repeat words after another, or can use exclamations on being irritated, the disease is probably in the first temporal convolution. If the patient can understand and can talk, but replaces a word desired by one that is unexpected, the disease is probably situated deep within the Sylvian fissure, or in the white substance of the brain, and involves the association fibres which join the convolutions just named.

In making a diagnosis of cortical disease care must be taken to distinguish between direct and indirect local symptoms; and also to separate clearly lesions of the cortex from those of the various white tracts within the substance of the brain.

If the facts here gathered from a study of the American cases of cortical disease prove an aid to diagnosis the object of the writer will be attained.

NEW YORK, No. 29 EAST 62D STREET.

ARTICLE X.

ON THE PATHOLOGY OF PAGET'S DISEASE OF THE NIPPLE.

By LOUIS A. DUHRING, M.D., Professor of Diseases of the Skin in the University of Pennsylvania, and HENRY WILE, M.D., Clinical Assistant in Dermatology in the University of Pennsylvania, and Assistant Physician to the Philadelphia Dispensary for Skin Diseases.

IN the July number, 1883, of this Journal, one of us (Dr. Duhring) reported two cases of Paget's disease of the nipple, referring only to the clinical features of the disease. The notes below recorded deal with the specimen of the first of these cases.

The relation between certain diseased processes of the nipple and areola, and the subsequent development of mammary cancer, first pointed out by Paget, has already evoked some discussion. The importance of the subject is apparent, and it ultimately resolves itself into the question of distinguishing between ordinary eczema of the nipple and another similar cutaneous pathological process which on good grounds is believed to lead to the formation of malignant disease of the mammary gland.

The histology of the two diseases, as already indicated by Thin (*Brit. Med. Jour.*, May, 1881) in an able article on this subject, is distinct. He says, "The microscopical examination is decisive on this point, and proves definitely that the disease is not eczema." But the question

of paramount interest and importance is to settle the exact relation between the cutaneous affection and the subsequent development of cancer in the gland. There is supposed, by the best authorities, to exist a causative relation between the first and second.

Paget (*St. Barthol. Hosp. Reports*, 1874, p. 83) was the first to call attention to this affection, and pointed out the relation between surface irritation and the development of cancer, *e. g.*, epithelioma of the lip.

Busch (*Langenbeck's Archiv*, Bd. xxi. p. 673) maintains that the beginning of destructive epithelial cancer is, in many cases, simple epithelial proliferation on the outer surface of the skin; that the collection of epithelial masses about the nipple may cause retention of secretion, and under circumstances lead to cancer.

The manner in which chronic cutaneous inflammation of the nipple leads to the development of cancer is still a subject of dispute. Butlin (*Med. Chirurg. Trans.*, vol. lx. p. 153) concludes that after a time the epithelial lining of the lactiferous ducts became affected, and that the disease travelled along the larger ducts reaching the smaller ducts and finally the acini which became dilated, filled with proliferating epithelium that, at length, escaped into the surrounding tissue. Thin (*Brit. Med. Jour.*, May, 1881) believes that the cancerous formation is the result of an abnormal development of duct epithelium, and that the skin affection is secondary "to a destroying agent extending from the mouths of the lactiferous ducts into the surrounding papillary layer." "The development of malignant papillary dermatitis of the nipple is suggestive of the escape of a fluid through the mouths of the ducts, which possesses the corrosive qualities of cancerous epithelium." He regards the new formation as a duct cancer, and believes that "cancerous changes are developing in the ducts long before they give rise to sufficient indurations to produce a palpable tumour."

As to the microscopic appearance of the tissues of most of the cases thus far presented, there is a striking similarity. Butlin (*Med. Chirurg. Trans.*, vol. lix. p. 108) presented two cases, and in one of them the mucous layer of the epidermis had undergone proliferation and thickening, and the corium and subcutaneous connective tissue were indurated and infiltrated by small round cells. The lactiferous ducts were found widely open and distended, not lined by cylindrical epithelium, but containing large masses of epithelium of a squamous and glandular type. Some of the ducts were seen completely filled, so as to present the appearance of sections of tubes in tubal nephritis. The immediate vicinity of the ducts was also the seat of a small round cell infiltration, which Butlin claimed has some relation to the proliferation of the duct epithelium. Waldeyer (*Virch. Archiv*, Bd. lv. p. 124) also speaks of the intra-acinous granulation growth in connection with the development of the epithelium

in the formation of cancer. Butlin (*Med. Chirurg. Trans.*, vol. lx. p. 153) presented two other cases of cancer of breast, preceded by eczema of the nipple and areola, in which there were observed in the cutaneous tissues changes similar to those of the two previous cases, and in addition, a dipping down of the epidermis into the cutis, and the presence of a few cell nests, giving the thickened portions the appearance of an epithelioma. In the tissue of the gland the partition walls of the acini and ducts were broken down and the epithelial contents had made their way into the surrounding tissue.

In his conclusions Butlin claimed that one of the effects of the eczema was to produce a proliferation of the mucous layer of the epidermis; that in time the epithelial lining of the lactiferous ducts became affected; that the disease travelled along the larger ducts, reaching the smaller ducts and the acini, which became dilated and filled with proliferating epithelium, that at length discharged into the surrounding tissues; finally, that cancer thus formed was essentially a disease of the epithelium.

Lawson (*Clin. Soc. Trans.*, vol. xiv. p. 222) presented a case of eczema of the nipple, in which the breast was removed and examined microscopically by Dr. Thin. The latter found it almost entirely composed of fat permeated by streaks of connective tissue, which, under the microscope, was found to consist of white fibrous tissue, in which were lodged epithelial tubes of various sizes, having a small columnar epithelium lining. A similar condition was found in our case, to be referred to presently. Thin called it adeno-lipoma. The skin was the seat of malignant papillary dermatitis, many of the cells of the rete being degenerated, while the corium contained a stratum of dense cell infiltration.

Morris (*Med. Chirurg. Trans.*, lxiii. p. 87) described two cases, in the first of which the mammary gland was in a condition of atrophy, represented by straggling fibrous bands in a substance of fat; the skin was crowded with a cell-infiltration, while the lactiferous tubes were filled with epithelium. In the second case the examination was made by Thin, and showed cancer of the gland. Sections through the nipple showed tubes filled with epithelium, and sections of skin revealed the almost total absence of the epidermis, a ragged remnant of the rete, and the epithelium in a process of degeneration. The papillary layer of the corium was congested and filled with exudation cells, while the pars reticularis was mostly normal.

Porter (*Boston Med. and Surg. Journal*, May, 1872) reported a case of chronic destructive inflammation, in which the papillæ of the corium abruptly changed their character, becoming much elongated, covered and surrounded by an increased quantity of epithelium. The subcutaneous tissue was observed to be thickened and infiltrated with small cells, and while some of the milk ducts of the nipple were of normal size and lined with a single layer of epithelium, others were packed with epithelium, and

the neighbourhood was seen to contain numerous cancer nests. The tissue of the mammary gland showed commencing cancerous degeneration; the nipple was entirely destroyed.

De Schweinitz (*Medical News*, February 9, 1884) describes a case of Paget's disease, followed by cancer of the mammary gland, in which there were proliferation and degeneration of the mucous layer of the epidermis, also an extension downward. The papillary layer was found to be the seat of a dense, small, round-cell infiltration, at times hiding all trace of normal structure; the lymph spaces in the subcutaneous tissue were seen to contain varying amounts of epithelium; the lactiferous ducts were found choked up with proliferating epithelium, which was seen escaping into the surrounding connective tissue, there forming alveoli of true scirrhus cancer. The gland tissue contained alveoli of spheroidal epithelial cells similar to those found in the subcutaneous connective tissue.

Dr. De Schweinitz has kindly furnished us with specimens of tissue from his case, from which sections were made for comparison with those obtained from our own case. These sections, examined under low magnifying power (50 diameters), show here and there a slight, thin remnant of the horny layer of the epidermis, and a marked thickening of the upper layers of the rete, where it is present, while the papillary layer of the rete is seen to send insinuating prolongations into the tissues of the cutis. The papillary layer of the corium is for the most part substituted by the proliferating rete and a dense cellular infiltration, and the papillæ, where present, lie exposed and fringed with a few adherent rete cells. The upper and middle layers of the corium contain slight perivascular inflammatory exudations, while the lower layers and subcutaneous connective tissue are the seat of variously-sized alveoli of scirrhus cancer, as has been clearly described by Dr. De Schweinitz.

Under higher power (250 diameters) the rete is seen to be in an active state of proliferation, the cells forming in a peculiar concentric manner, to be fully described presently, burrowing downwards into the corium and extending laterally, thus compressing the papillæ, making the latter appear in many places as a mere narrow column of cells. The layers of the corium immediately beneath the papillæ contain an often dense infiltration of small round cells which, where the papillæ are present, extend into them, hiding all trace of their normal structure. The subcutaneous connective tissue bordering on the site of the nipple contains small alveoli of epithelial cells, which increase in number and size as the lactiferous ducts are approached. On account of the stratified condition of this cutaneous tissue, these alveoli may be seen to assume, at first, a linear form, later becoming ovoid. The larger lactiferous ducts are everywhere seen filled with an exuberant growth of epithelium, which in many places has penetrated the walls of the ducts and escaped into the surrounding tissue. Two of these larger ducts, however, while crowded with

epithelial cells are seen to have intact walls, and the surrounding tissue is free from cancerous growth.

The notes about to be presented were derived from a study of our own case. Examination of sections through the nipple, perpendicular to the surface, under a magnifying power of fifty diameters reveals the following:—

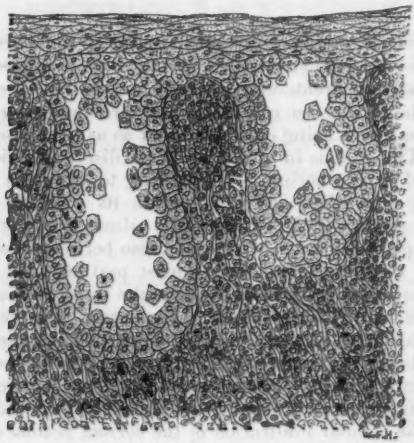
The surface of the lesion is almost denuded of the horny layer of the epidermis, here and there small islets of the same being seen which form thin, dry, loosely adherent, and partially exfoliated layers. Just over the centre of the nipple the rete Malpighii presents an irregular broken surface, in some places being entirely absent so as to expose the papillæ of the corium. The rete is in a condition of disorganization, and seems loosely attached to the corium. Proceeding towards the periphery, this disorganization grows less and less, and in its place is a condition of increased cell growth. Many variously sized empty spaces may be noticed in the papillary layer of the rete, also between it and the corium. The papillæ of the corium are for the most part crowded with a cellular infiltration to such an extent as to change the form, size, and general appearances, even to hide all traces of their normal structure. Some are enlarged to twice their normal size, and constricted to various degrees at their bases; others are compressed laterally, and present the appearance of a narrow column of cells. Occasionally they are entirely obliterated, their places being marked by small heaps of cellular material. Proceeding peripherally, the cellular infiltration of the corium becomes so dense as to almost obliterate the boundaries between it and the epidermis. Passing into the lower layers of the corium strands running perpendicularly and obliquely downwards, and variously sized and shaped clusters and aggregations of small round cells may be seen.

Under a magnifying power of 250 diameters a more intimate knowledge of the tissue components and various structural changes are made apparent. The epithelial cells of the horny layer had absorbed the staining fluid to a slight extent, and their nuclei are well marked. The cells of the rete are seen in various stages between active proliferation and degeneration. In each interpapillary projection of the rete there is formed an alveolus with a central zone of degeneration and a peripheral zone of proliferation and growth (Fig. 1). In some places indications of the formation of alveoli may be seen in that the cells are beginning to assume a concentric arrangement. In other places the disorganization of the epidermis is complete, and nothing remains but a nest of cells. As this cell growth advances the papillæ of the corium are encroached upon, become œdematous, compressed, and constricted at their bases (Fig. 2).

The cells composing the peripheral zone of the alveoli are of the epithelial type, of squamous and cuboidal variety, have an abundance of protoplasm, and one or several nuclei which are irregular in shape and have a granular contents. Close observation shows the cells to exist in various forms, some being round, some oval, some elongated and spindle shaped, exhibiting a disposition to divide in the centre to form two cells. The cells of the central zone are more or less granular, and exhibit evidences of fatty degeneration. This condition of proliferation agrees with an observation made by Butlin (*Med.-Chirurg. Trans.*, vol. lix. p. 108, also vol. lx. p. 153), that "the mucous layer had undergone pro-

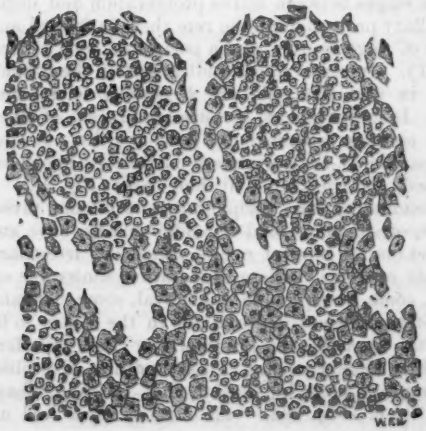
liferation, and was thickened, and here and there dipping down into the cutis." The same appearances and arrangement of cells in the rete may also be noticed in the specimens from the case of Dr. De Schweinitz. There is no doubt in our minds as to the relation of the alteration and

Fig. 1.



obliteration of the papillæ of the corium to the proliferation of the rete. As the epithelial cell growth of the rete advances downwards, the bases of the papillæ become more and more constricted, causing the papillæ first to assume a pyriform shape, as in Fig. 2; then the pressure being continued

Fig. 2.



on the papillary capillaries causes the upper ends of the papillæ to swell and become filled with a lymphoid cell exudation. The papillæ finally become detached, and one sees alveoli of lymphoid cells in the midst of a dense epithelial cell mass. These lymphoid cell alveoli undergo degeneration, drop out and give rise to some of the numerous empty spaces found in the rete.[1]

The strands and aggregations of small, round cells, scattered about in the layers of the corium are perivascular lymphoid exudations of an inflammatory type. In many places arterioles and capillaries may be seen in transverse and longitudinal section, surrounded to a greater or less extent with such collections of cells.

In the middle and lower layers of the corium are found alveoli of various sizes and shapes, completely or partially filled with epithelial cells, which are regarded as true and typical carcinomatous formations. The alveoli are surrounded by a dense stroma of connective tissue, in the meshes of which may be found a varying amount of lymphoid cellular material. The connective tissue forming the stroma is in some places embryonic in character, especially where the perivascular exudation referred to above exists in large amounts; in other places it may be seen to form large, thick bundles penetrated in every direction by the insinuating, destructive, solid pegs of epithelium. On the other hand, it is seen in thin atrophic bundles, resembling greatly cicatricial tissue. This is particularly the case just under the site of the nipple, and extending downwards. Sections made from the tissue about one and one-half inches below the surface reveal only bands of dense, atrophic, connective tissue surrounded by adipose tissue, without a vestige of gland structure or lactiferous tubules, just as also described in the cases of Lawson and Morris above referred to. This condition would lead us to regard the new formation as an *atrophying scirrhus*. Nowhere is there to be seen any evidence of the formation of cysts, as was the case in Thin's specimen. There is, in other words, no resemblance to the "fibro-carcinoma cysticum mammæ" of Waldeyer. The dense atrophic, cicatricial-like connective tissue immediately under the site of the nipple and extending downward may have contributed much in bringing about the retraction of the nipple which is so characteristic of Paget's disease.

The large lactiferous ducts about one-quarter of an inch below the surface are seen with their lumena partially or completely filled with epithelial cells. The elastic layer of Henle and the inner layers composing the duct walls are intact, and nowhere give evidence of perforation on the part of the contained epithelium. The same is found to be the condition of two large lactiferous ducts in the specimen from the case of Dr. De Schweinitz. The tissue in the immediate neighbourhood of these ducts is made up of loose connective tissue which is the seat of a dense small-cell infiltration. The smaller lactiferous tubules found about three-quarters of an inch below the surface are also seen to contain varying amounts of epithelium, but the duct walls are not everywhere found to be intact. Cells may be seen between the layers composing the walls, and in some places in considerable amounts, while occasionally a breach through the entire wall is observed and in the vicinity are large cancer alveoli. Thin has

[1] It may occur to some, that these appearances were all due to the fact that the sections were cut obliquely, but this was not the case, as great care was taken to make the sections as nearly perpendicular to the surface as possible.

also pointed out certain "finger-like columns which had broken through the wall of the duct and advanced into the elastic layer," which condition is applied to the larger ducts, and not as in our case to the smaller ones.

One of the striking features of the specimen, a feature which was also called attention to by Thin, is the comparative little change in the layers of the corium immediately beneath the papillæ, notwithstanding the profound changes above and below. In fact the only pathological deviation here consists in the perivascular exudations. This fact, it seems to us, has some bearing upon the direction in which the new growth is advancing, careful examination and comparison of sections showing that the epithelial pegs or radicles are creeping upwards and outwards. The alveoli are largest in the lower part of the specimen, and gradually diminish in size as the surface or lateral part is approached, while the upper layers of the corium are not yet involved, all of which indicates that the centre of growth is in the region of the smaller collecting ducts, about one inch or three-quarters inch below the surface. This is supported by the fact that the walls of the larger ducts are intact and their immediate vicinity is entirely free from cancerous infiltration.

Sections taken from the border of the cutaneous tissue present an histological picture which confirms the clinical fact that the disease is sharply defined and ends abruptly. The transition from healthy to diseased tissue is characterized by a sudden descent caused by the lymphoid infiltration of the papillary layer of the corium, and the beginning alterations in the rete Malpighii. The appearance corresponds with that described by Thin as follows: "The line of demarcation is indicated sharply by the projection downwards into the cutis of a rounded wall of epidermis, on the further or healthy side of which the cell exudation ceases."

Finally, the question arises as to the relation between the affection of the skin and the cancer new formation. The view adopted is one based on one side upon the minute anatomy of the part, and on the other upon the histological facts presented by the specimens. The disease is regarded as an abnormal epithelial cell proliferation which begins in the rete Malpighii. Anatomically the lining membrane of the lactiferous ducts is a continuation or simple indentation of the epithelial layers of the epidermis, and by continuity the tendency or impetus to growth which characterizes the epithelium of the rete in this disease, is communicated to the cells of the ducts, and as the growth proceeds the lumena of the ducts soon become filled with cells. Advancing from the surface towards the interior the ducts grow smaller by ramification, and their walls grow correspondingly thinner. The larger tubes, of which there are twelve to twenty, are surrounded, in addition to the fibrous and muscular coats, by a tough, elastic layer described by Henle. This is barely present in the smaller tubes, and as a consequence the walls of the smaller tubes first give way, and the epithelium makes its way into the surrounding tissue and advances towards the surface as described. This observation is also confirmed by the condition of the ducts found by us in Dr. De Schweinitz's case, though to a less extent because the specimens represented a more advanced stage of the disease.

Summary.—1. Horny layer of epidermis present in thin, loosely adherent, partially exfoliated layers, and in some places absent, so as to expose the papillæ of the rete Malpighii, which in turn is occasionally absent, exposing the papillæ of the corium.

2. The rete Malpighii is in a condition of abnormal growth and degeneration. In each papilla there is formed an alveolus, or concentric arrangement of the cells, in which there is a central zone of degeneration and a peripheral zone of proliferation.

3. The papillæ of the corium, infiltrated by dense masses of lymphoid cells, are encroached upon, compressed, and finally obliterated by the proliferating rete.

4. The upper layers of the corium, with the exception of a varying amount of perivascular lymphoid exudation, are the seat of little change.

5. In the middle and lower layers are variously sized alveoli of epithelial cells, regarded as typical cancer new-formation.

6. The stroma, in more recent formations, is embryonic; in later stages it is atrophic, almost cicatricial.

7. The cicatricial-like connective-tissue, under the site of the nipple, may contribute much in bringing about retraction.

8. The larger lactiferous ducts, though carcinomatous change has already taken place in them, are present with intact walls. They are filled with epithelial cells. The smaller ducts are also filled with cells, and occasionally a breach through the entire wall is observed, and, in the immediate vicinity, typical cancer structure may be seen.

9. Sections from the border of the diseased cutaneous tissue show a sudden transition from healthy to diseased structure.

10. The affection is regarded as an abnormal proliferation and degeneration of the rete, with secondary destruction of the papillæ of the corium, and subsequent development of scirrhus cancer of the atrophying variety.

11. The cancerous change takes its origin from the epithelium of the smaller ducts, and advances from below upwards and outwards as far as the skin is concerned; later it attacks the gland structure.

12. The retraction of the nipple is an early sign of carcinomatous change.

ARTICLE XI.

BRIGHT'S DISEASE OF MALARIAL ORIGIN.[1]

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THE liver and spleen are the only viscera upon which paludal intoxication can be said to exert a constant and specific influence. The patho-

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logical changes induced by it in other organs are, for the most part, inconstant, and have received but comparatively little consideration from medical writers; and yet in the kidneys the alterations almost attain the characters of specificity in those results of malarial fever more commonly encountered in warm climates, and more especially in our own Southern States, and which have received of late considerable notice from intelligent observers. I refer to those paludic fevers in which hæmaturia and hæmoglobinuria, with the, probably, invariable accompaniment of albuminuria, constitute a characteristic feature of the attack. The unmistakable evidences of renal derangement in this form of the disorder—of which, however, it is not designed to speak in this paper—would lead, *a priori*, to the conclusion that renal alterations of more permanent character may, likewise, occasionally depend upon the same influence, when brought to bear upon the kidneys under different circumstances and in diminished intensity, though with frequent recurrence. Indeed, nearly all systematic writers upon Bright's disease agree in attributing a certain influence in its production to malarial disorders, though they are usually content to dismiss the subject with a very few words. That renal derangements, thus arising, should frequently escape attention may be explained, to some extent, by the fact that they are often confounded with the dropsies so very frequently resulting from malarial fever, commonly entirely independent of renal disorder, and due to causes that must probably be sought for as direct results of the malarial poison upon the blood and vascular system.

The first mention of albuminuria occurring in the course or as a result of malarial fever, is said to have been by Blackhall, who described it as occurring after intermittent, in 1818 (Calmette, *Recueil de mémoires de médecine et de chirurgie milit.*, 36, 1880). In 1845, Chenouard (*Rec. des trav. de la Soc. Méd. du depart. d'Indre-et-Loire*, 1845, p. 101) expressed the opinion that intermittent fever, so frequent in the department, was one of the principal causes of nephritis and albuminuria. Cases were also described by Neret in 1847 (*Arch. Gén. de Méd.*, xv. 509); and Martin Solon (*Gaz. Méd.*, 1848, p. 618) declared that albuminuria was to be detected in one-fourth of all intermittent fever cases. In his inaugural dissertation, Lenz also claimed that intermittent fever was a very frequent cause of diffuse nephritis (*De diffusa nephritide chronica, præcipue respecto decursu morbi post intermittentem febrim*, 1865, Gryphiæ). Rosenstein (*Pathologie u. Therap. der Nierenkr.*, Berlin, 1870, p. 215, and Virchow's *Arch.*, B. 14, 110) saw in Dantzic, on the Baltic Sea, 23 per cent. of renal disease, definitely attributable to preceding malaria. Bartels (*German Clinical Lectures*, N. Syd. Soc. Trans., vol. lxvi.), while admitting that he had not been able to trace the granular contracting kidney to malaria, says, "chronic inflammatory enlargement of the kidney may, in isolated cases, originate from acute nephritis following a

severe chill or scarlet fever. But, in my experience, malaria is the most frequent amongst the well-established causes of this disease." Hertz (*Ziemssen's Cyclop.*, vol. ii. p. 641) asserts that "it is no very uncommon thing to find albumen present in considerable quantities. This may correspond with the hyperæmia of pernicious and remittent fevers, and is then usually accompanied with an abundant admixture of blood; but it appears that even simple malarial fevers may show a highly albuminous condition of the urine, and even renal hemorrhage during their course. . . . . Albumen is to be found in the urine, either only on the fever days, or during the intermission as well, ... and disappears on recovery. Still, cases do occur which pass into a chronic diffuse nephritis." An evidence of the occasionally great frequency of renal affections is also afforded by the observations of Soldatow, who detected derangements of the kidney at 350 necropsies of soldiers of the Russian army dead of malaria in East Roumelia, during the summer of 1878 (*Petersburg. med. Wochenschr.*, 1878, No. 42). Cases have also been recorded by Devalechi (*Arch. Belges de Méd. Mil.*, xxiii. 20), Verhaige (*ibid.*, xxvi. 31), Schmid (*Deutsche Klinik*, iv. 442), and others on the continent of Europe.

As might be expected, English authors, doubtless, on account of the the rarity of malarial diseases in England, have but little to say upon this subject. Roberts has not met with any case of renal disorder occurring as a sequela of ague; but Dickinson felt compelled to admit that he had seen more than one instance of persons who had returned from India with persistent albuminuria, and symptoms of the granular kidney, after having, while there, severely suffered from malarious fever. McLean, likewise (*Reynolds's System*, i. 613), speaking of intermittent fever, says, "Albumen is found in an uncertain number of cases during the fit, with blood and renal cylinders. I can confirm, from personal observation, Dr. Parke's remark, that chronic Bright's disease is a consequence of ague. Many 'old Indians,' who have suffered from malarial fevers, die of this disease." Other English authors refer to the conditions under discussion.

In America, renal disease as a result of malaria has attracted the attention of a number of writers. Woodward, in his *Camp Diseases* (1863, p. 185), says of the results of chronic malarial poisoning: "Disorder of the kidneys frequently complicates the condition under consideration. Scanty, more or less albuminous urine is often observed, and those cases which occasionally perish with the symptoms of acute uræmic toxæmia, not unfrequently terminate in chronic Bright's disease, with confirmed albuminuria, œdema, or general anasarca, and the whole train of symptoms of that disorder." Busey (*Am. Jour. Med. Sci.*, Jan. 1873, and *Transact. Amer. Med. Assoc.*, 1880) records a number of cases of renal disease in children, the origin of which he attributed to malaria. Da Costa (*N. Y. Med. Rec.* 17, p. 54) declares that he has "seen a large number of cases

of Bright's disease following malaria." Observations upon renal alterations due to malaria, with cases, have also been recorded by Loving (*Columbus Med. Jour.*, i. 1883, 289), Berkley (*Maryland Med. Jour.*, x. 1883, 227), Pepper (*Am. Jour. Med. Sci.* 1866, li. 405 and 408), Clemens (*Louisville Med. News*, 1880, x. 145), and others. The subject has also received consideration from Santiago (*Gaz. Med. di Lima*, 1866–67, xi. 42), and in the *Tokei Med. Journal*, March 27, 1880, from Koike, the contents of whose articles I have been unable to avail myself of.

There are not wanting, however, those who do not admit malaria as a cause of Bright's disease, or at least concede that only very rarely does it exert such an influence. Among these are Colin (*Traité des fièvres intermittentes*), Jaccoud (*Pathologie interne*), and Rendu (*Thèse d'aggregation*, 1878).—(Calmette). Rosenstein quotes Becquerel as saying: "I have had opportunity, in an especially damp and swampy region, to observe, every autumn, patients, of whom some had dropsy, but never one of them Bright's disease." He also quotes Frerichs, as follows, viz.: "Among a large number of dropsies after intermittent, which I observed along the North Sea coast, there was not a single case in which the kidneys were diseased." Hirsch (*Historisch. Geogr. Pathologie*, ii. 342) also denies that Bright's disease from malaria occurs with more than the greatest infrequency; and Bamberger (*Samml. klin. Vorträge*, No. 173, Leipzig), in a summary of 2430 necropsies of patients dead of Bright's disease, was able to associate paludal toxæmia with but 13, or 0.5 per cent. of the whole number. He admitted, however, that in his locality malaria played but a most insignificant rôle. This want of agreement is to be explained, not to the discredit of any of these observers, but by the fact that the renal complications of malarial intoxication depend upon varying and not understood conditions of climate, soil, temperature, etc. Indeed, they have been known to prevail most unequally in different epidemics in one locality. For example, Rosenstein, who saw in Dantzic 23 per cent. of all cases of Bright's disease definitely attributable to malaria, encountered in Northern Holland, in Groningen, "a fever province, κατ'ἐξοχήν," much malaria indeed, but only seldom nephritis in consequence. And Heidenhain, who observed in Marienwerder a series of epidemics of intermittent fever in which neither dropsy nor renal affection developed, encountered, in a last epidemic, hardly a case without secondary nephritis.

From the foregoing synopsis of the experiences and opinions of writers, it becomes evident that malarial poisoning implicates the kidneys in no fixed and definite proportion of cases, and that when a morbific influence is exerted upon these organs it cannot be as a result of any characteristic and peculiar process. The fact remains, however, that in an indeterminate number of cases renal disorder will be excited, varying from the sudden and intense congestions with hæmaturia or hæmoglobinuria and

albuminuria, of pernicious and certain other severe forms of malarial fever, to renal inflammations of unequal intensity, resulting in exudations and deep structural alteration. It is to the latter form of alterations, those associated with extensive structural disorders of the kidneys, that the present remarks are devoted. It is to such pathological processes that the term malarial Bright's disease may, with propriety, be applied.

Believing that the subject has not attracted, in this country at least, the attention it deserves, I have been led to study with reference to it all cases of malarial fever coming under my observation during the late summer and early fall of the past two years (1882 and 1883) at Bayview Asylum, the Baltimore Almshouse. The first series of cases numbered 76, and was recorded in 1882. This series served Dr. Hiram Woods and myself a basis for testing the asserted merits of iodine as an antiperiodic remedy (see *Amer. Jour. Med. Sci.*, July, 1883); and, inasmuch as the iodine may possibly have exerted some influence in the production of renal disorder, I do not present this series as giving unobjectionable evidence in the direction of the present research. In the light of the results of the second series of observations, I am inclined to attribute little or no influence to this agent in the production of the albuminuria. At all events, I give the results of the observations for what they are worth. Of the 76 cases of intermittent and remittent fever, albuminuria was noted but five times. One case was that of a woman who had suffered from irregular attacks of ague for more than two years, and who also had chronic Bright's disease. We were unable, however, to discover a causative relation between the two disorders. In one case of remittent fever albuminuria was present upon a single occasion during the twelve days of observation. Another case of quotidian ague developed albuminuria after a week's sojourn in the hospital. This symptom disappeared after four days, under the administration of sulphate of cinchonidia. Albuminuria appeared in another case of quotidian ague after the fifth day of treatment. Cinchonidia promptly relieved the chills and the renal symptoms, neither occurring during the eighteen days of his rest in hospital. These cases, except the first, were evidently dependent upon transitory circulatory disturbances. A single case of this series presented symptoms that indicated profound renal alterations apparently the direct result of malarial toxæmia. An abstract of the notes, taken by Dr. Hiram Woods at the bedside, gives the following history:—

CASE I.—Harris, an Englishman, 26 years old, ostensibly a labourer, but manifestly a tramp, was admitted September 21st, with a history of tertian malarial fever for eight days. He had the aspect of one who had endured many hardships. On the afternoon of the 22d he had a chill. His urine, examined after the paroxysm, was acid, of specific gravity 1012, and without albumen. He was ordered to take thirty drops of tincture of iodine four times daily. He missed the expected chill on the 24th, but had one on the 25th, at midday. He had no chill from this

time. On the 28th his dose of iodine was reduced to ten drops, and on the 29th was discontinued. He felt very badly, however, but had no elevation of temperature. Swelling of the ankles and some ascites now developed. An examination of his urine gave specific gravity 1008; no albumen. Two days later there was marked ascites, general anasarca; and on October 3d his urine contained a large amount of albumen with hyaline, finely and coarsely granular tube-casts. His temperature, however, did not exceed 99° F. He was pale and puffy, his pulse was weak and frequent, bowels constipated, tongue pale and coated. There was much dyspnœa from pulmonary œdema, and decided abdominal discomfort. The urine was much reduced in amount, though the exact quantity was not ascertained. Infusion of digitalis in half-fluidounce doses thrice daily, with drachm doses of compound jalap powder once daily, were now ordered. On the 6th the amount of urine passed during the twenty-four hours was two quarts.. On the 9th the patient passed four pints of urine. Nevertheless, his condition became alarming, dyspnœa being very urgent. On the 10th he passed seven pints of urine of specific gravity 1012, albuminous, and showing abundant tube-casts. The temperature did not exceed the normal during these days, but on the 13th the morning temperature was 99.2° F. The strength was now much reduced; and, notwithstanding the free micturition, the dropsy increased. Abdominal pain became very distressful. For the relief of this, one-sixth gr. of sulphate of morphia was injected hypodermically. The morning temperature of the 14th was 100° F.; pulse, 80. Evening temperature, 100° F.; pulse 88. Upon this date the urine was free from albumen. *15th.* Morning temperature, 98.8° F.; pulse, 100; urine passed during twenty-four hours, three pints. *Oct.* 20. The urine was again highly albuminous. The albumen now rapidly disappeared, and at the examination of 26th not a trace of it was found. It did not reappear, though the patient remained under observation for several months. There was no return of fever, and the dropsy slowly disappeared, though the face remained pallid and swollen. Tincture of the chloride of iron, with dilute acetic acid and spiritus mindereri, was the only remedy employed during convalescence.

The cases observed during the late summer and fall of the past year (1883) enabled me to observe more exactly the effects of malaria upon the kidneys, since attention was more especially turned toward these points, and since there could be no question of the ingestion of remedies that might possibly irritate the urinary organs. The cases were placed upon appropriate anti-periodic treatment (the sulphate of quinine or of cinchonidia) as soon as the diagnosis was determined and cured with all possible dispatch. They numbered 45, and suffered principally from intermittent fever, though some examples of remittent fever were observed. For the most part, they were Germans, employed about the canning establishments of Harford County, where, although sufficiently fed, their ignorance of hygienic laws exposed them to the violently malarious influences of the localities in which they worked. As a test for albumen, picric acid was first adopted, but it soon became evident that the quinine taken by the patients vitiated the test (see article on "The value of picric acid as a test for albumen, by Drs. Cook and Watkins, *Medical*

News, Oct. 27, 1883), and the ordinary heat and nitric acid or the floating nitric acid test, after Heller's method, was employed as certainly reliable and very handy.

Of 45 cases of malarial fever, carefully examined with respect to their renal organs, six presented evidences of albuminuria during their attack. Three of these were affected to a slight and transitory extent. One, a German, 52 years of age, had had daily chills for twelve days. Upon admission a faint precipitate of albumen was detected in his urine. Albuminuria to very slight extent was also present two days later and hyaline tube-casts were observed. There was no anasarca and after the cessation of the chills the albuminuria disappeared. The second case was also of a German, 41 years old, who had had quotidian ague for ten days. His chills were promptly relieved by cinchonidia sulphate, but his urine examined on the third day after admission was faintly albuminous, acid, and of specific gravity, 1017. No tube-casts could be found upon microscopic examination. There was some headache with nausea and vomiting, but no dropsy. Five days later there was still a very faint amount of albuminuria, but without œdema. The patient now left the hospital, but was evidently improving, with every promise of ultimate perfect recovery. The third of these cases was of an Irishman 58 years old, who had had quotidian ague for two weeks. Upon admission his urine was acid, sp. gr. 1022, and contained a decided amount of albumen. The ague was immediately stopped by sulphate of cinchonidia and the albuminuria ceased at the same time. The urine, though carefully examined several times previous to his discharge, remained normal. The remaining three cases had well-marked nephritis which evidently depended upon malarial toxæmia.

CASE 2.—Hochstadt, German, 29 years old, was admitted September 14th. He had been working in a canning house at Aberdeen, in Harford County, and was quite well until the beginning of his present attack, thirteen days previously. Since then he had had quotidian intermittent fever. When admitted he was in the midst of a paroxysm. He was anasarcous and profoundly anæmic. His urine was acid, of sp. gr. 1012, and loaded with albumen. The anasarca had first been noticed one week previously, and had involved both upper and lower extremities. There was, however, no ascites. His tongue was pale, tremulous, and slightly furred. Subcrepitant râles could be heard over both lungs posteriorly, with diminished resonance and vocal fremitus. Slight left pleural effusion was diagnosticated. His pulse was 108; his temperature was normal. He was ordered to take ten grains of sulphate of cinchonidia thrice daily. This treatment was continued without return of ague. On the 18th his urine was acid, 1013 sp. gr., and contained considerable albumen. Microscopically, amorphous urates, and epithelial, and finely and coarsely granular tube-casts were detected. He was now much better, and left the hospital, though dropsy and albuminuria were still present. He was readmitted Sept. 27th, complaining of diarrhœa. Anasarca was still present, though to a greatly diminished extent. The temperature remained normal. His urine, examined October 4th, was without albumen. On the 5th, how-

ever, the albumen tests gave a faint reaction. On the 11th decided improvement was noted, though some œdema still remained. A very faint cloud was shown by the nitric acid floating test (Heller's method). Microscopic examination revealed a few hyaline tube-casts. He again left the hospital, much better though not entirely free from evidences of renal disorder.

CASE 3.—Sheridan, Irish labourer, 30 years old, was admitted September 26th. He had been ill four weeks. His attack began with "dumb-ague," then for two weeks he had had quotidian intermittent. Lately his fever had taken on the remittent type. Previous to the present attack, he reported his health to have been excellent, and that he had performed ordinary farm labouring work. Two days before admission he had noticed swelling of his feet. Upon admission he was found to be a stout, well-built man, but very pallid and slightly dropsical. His tongue was slightly furred. His urine was acid, of sp. gr. 1012. It gave no precipitate with heat or nitric acid, but a faint cloud appeared with the picric acid test. (He informed me that he had taken some quinine on the 21st, four days previously; so that the true significance of this reaction remained undecided). No microscopic examination of the urine was made at this time. He had an aortic direct murmur of some intensity. Full doses of cinchonidia sulphate were now prescribed with the result that his fever was suspended on the fourth day. The anasarca increased, however, and slight ascites appeared, but albuminuria appeared first October 2d, when a decided amount was observed. On the 3d, the entire amount of urine passed was three pints. It was acid, of sp. gr. 1010, and highly albuminous. Tube-casts, finely and coarsely granular, hyaline and epithelial, were present in great numbers. Dyspnœa had now appeared and was marked. Slight double pleural effusion had developed. He was now ordered to take infusion of digitalis in half-ounce doses in addition to a ferruginous tonic thrice daily in lieu of all other treatment. On the 10th he had a new access of ague of rather intense character. Sulphate of quinia, 15 grains, daily was added to his other remedies. After this there was no renewal of his febrile attacks. The albuminuria persisted, however, slowly diminishing with the improvement of the patient's general condition, though when he was last seen there was still some anasarca and albuminuria. The aortic direct murmur also persisted.

CASE 4.—Lock, 56 years old, born in London, widower, was admitted October 16, 1883, for an irregular and obstinately recurring intermittent fever associated with pronounced renal disease. I was fortunate in being already acquainted with the antecedents of this patient, having had him under my care shortly after the beginning of his illness, at the University Hospital, Baltimore (in April, 1882). The patient was of small and delicate physique and by occupation a baker. In the fall of 1881, he had been seized, for the first time, with intermittent fever at his home in Harford County. This was at first quotidian, became tertian, and finally irregular, and although large quantities of quinine were given, relief could only be secured for brief periods. Having been a perfectly healthy man, he now began to decline in general health, and after several months he noticed that his body had swollen. Gradually he became incapacitated for work, and finally was admitted to the hospital, where he came under my care. He was at this time very anasarcous, and had much peritoneal dropsy and was extremely debilitated. He had albuminuria. Under the administration of quinine and ferruginous diuretics his health slowly im-

proved until his dropsy disappeared; and he ultimately became able to work about the wards. His chills persisted irregularly, and his albuminuria remained constantly, with greater or less intensity. After several months he felt well enough to go to work again, and he was lost sight of until his admission to Bayview. In the interval he had wandered about between Washington, Philadelphia, and New York, spending his time partly at his trade and partly in hospital. He was now extremely reduced, and was profoundly affected by uræmia, which, however, was alleviated after a few days' treatment in hospital. He improved sufficiently to ask for his discharge, when he started again upon his travels. He entered the University again in March of this year, when I found him upon taking charge of my service on the 15th of the month. He was then suffering from a quotidian intermittent quickly but temporarily relieved by cinchonidia sulphate. His condition, in so far as concerns his dropsy, has improved. This has become very much less, though his urine is never free from albumen and tube-casts. His face is puffy and pallid, and he remains feeble. It would seem that the large white kidney, from which he originally suffered, without doubt, has passed gradually into a contracted kidney, from interstitial fibrosis, which has now assumed the dominating rôle in the morbid processes, as the parenchymatous changes did in the beginning.

All four of these cases seem to have depended upon that pathological condition that has been called the "large white kidney," the morbid process in each being tubal and diffuse nephritis. That neither of the men was the subject of acute tubal or parenchymatous nephritis may be concluded from the nature of the attack. In the absence of the malarial attacks, fever was not present, or was so only to a very slight extent and during a brief interval; the development of the inflammation was insidious, the appearance of dropsy more or less gradual. There was no chill as distinct from that of the malarial seizure; there was not the continuous high temperature, the flushed countenance, the injected conjunctivæ, the creamy coating to the tongue, the pain in the back, the extreme reduction in the amount of urine passed, the intensely albuminous condition nor the very high specific gravity of the more acute form of the disease. Even in Case 4, whose history I have been able to trace for two years, the symptoms were constantly such as one would expect in the course of "large white kidney" gradually undergoing contraction; not the primary contraction of ordinary granular or fibrotic kidney, but such as, gradually adding to the tubal changes cellular proliferation and interstitial connective-tissue formation, may ultimately terminate in true contraction; usually bearing, however, such characters as will serve to differentiate it from primary fibrosis, characters that have induced writers to bestow upon it the term "small fatty kidney" or "fatty granular kidney."

Careful observation of the recorded cases of malarial Bright's disease discloses the fact that in by far the greater number, the symptoms are those attributable to tubal and diffuse nephritis. Rosenstein unhesitatingly pronounces this to be the usual variety. It should be borne in mind, however, that I am now referring to such cases as present

evidence of pronounced renal alterations. It is undoubtedly true that the sudden and transitory albuminurias of ordinary malarial attacks are quite common. These, however, either result from renal hyperæmias that pass away so rapidly that no permanent structural alterations are produced, or from those pernicious cases in which death occurs before structural changes in the kidneys have time to develop, or, finally, frequently repeated, tend to run into more pronounced and permanent changes. It has already been stated that in malarial hæmaturia or hæmoglobinuria, albumen is always present. In many cases of ordinary malarial fever, albuminuria is present only during or immediately succeeding the attack. It may even be present upon the "ague" days, the urine remaining normal during the days of intermission. (Neret, *Arch. Gén. de Méd.*, xv. 1847, p. 509. Hertz, Ziemssen's *Cyclop.*, vol. ii. p. 641.) As a rule the alterations in the kidneys under these circumstances are only temporary, and speedily subside upon the removal of the exciting cause. Dropsy generally does not appear in these cases. It sometimes happens, however, that extensive structural changes are lighted up from the very first. Fortunately, the albuminurias due to transitory hyperæmia of the kidney from attacks of malarial fever are very much more common than that attributable to extensive renal inflammation; but it need hardly be stated that between the mildest grade of hyperæmia and the highest grade of inflammation of the organ, all possible degrees of morbid change may be encountered, and that, although nephritis to the extent developed in my above-described cases may justly be considered uncommon, the possibility of its occurrence in affections capable of so readily lighting up milder renal hyperæmias and inflammations is by no means remote. That the kidney can and does, far more frequently than is generally recognized, suffer both from the intense and the frequently repeated hyperæmias to which all the viscera are subjected in malarial fevers is shown in the hæmaturic and hæmoglobinuric forms of malarial attacks on the one hand, and on the other, in very many simple intermittent and remittent fevers, in which the albuminuria disappears with the cessation of the malady. In some cases, however, of intense or long-persisting ague, the renal hyperæmia continues, structural alterations develop, and the transitory albuminuria becomes chronic and confirmed. Tubal and diffuse nephritis is then the ordinary form encountered in those cases that exceed the limits of simple inflammatory hyperæmia, and attain the dignity of true renal inflammation.

Although, as Rosenstein remarks, cases usually get well or die before granular kidney develops, there can be no doubt that this form of kidney may result from malarial poisoning. It has been encountered by Rosenstein, Soldatow (*Petersburg. med. Wochenschr.* 1878, No. 42), Kiener and Kelsch and others. Dickinson admits its rare occurrence, as does also Axel Key. Hertz will not venture to say whether the con-

tracted kidney occurs after intermittent fevers; and Bartels, while recognizing "malaria as the most frequent amongst the well-established causes," does not admit that the *contracting* kidney may result from it. There seems to be indeed no evidence showing that that form of renal inflammation in which the changes are interstitial from the beginning, which is known by the name of fibrotic, granular, cirrhotic, true contracting kidney, etc., can ever be attributed to malaria; but without doubt, cases are not so very unfrequent in which tubal and diffuse nephritis passes after a time into fibrotic contraction. Of such, I take Case 4 of this paper to be an example.

It is difficult to determine whether there are definite conditions of malarial intoxications that more especially predispose to structural alterations of the kidneys. Rosenstein, who speaks more definitely than any other of the predisposing conditions of malarial poisoning (*Patholog. u. Therapie der Nierenkr.*, Berlin, 1870, p. 217), claimed that the fever in consequence of which the renal affection developed most commonly appeared under three conditions: viz., 1. The attacks were incomplete. The patients suffered during a long time (usually from the tertian type) with the cold and hot stages, but never the sweating stage; or 2. The attacks were complete, of tertian or quartan type and only few in number. Upon three or four similar attacks, succeeded several weeks, during which the patient, in consequence of the marked form of the fever, experienced only slight disturbance of general health; they attended to their work until dropsy appeared. This developed simultaneously with albuminuria or preceded it; or 3. The intermittent type of the fever persisted almost without interruption for months—in one case for two years—and the dropsy appeared for the first time upon the cessation of the attacks. Rosenstein declares that dropsy is a constant symptom in nephritis from intermittent fever, and that it here may reach a higher grade than in any other form. He, moreover, asserted that the urine showed the peculiarity that it never contained blood, but generally much albumen with relatively much urates and uric acid. This, however, is certainly incorrect as applied to the urine of malarial nephritis generally. Cases of renal hemorrhage in simple malarial fever have been reported by Hertz, Griesinger, Keiner and Kelsch, and others. Da Costa considers bloody urine one of the characteristic features of the malady. It thus appears that, although bleeding from the kidneys may be vastly more common in pernicious and severe remittent fevers, its absence from the kidneys of persons with simple ague cannot be assumed as of unvarying rule.

Regarding the etiology of malarial nephritis, the above-quoted author thinks that, in addition to the collateral hyperæmia in the kidney always united with the febrile symptom-complex, two other conditions must be considered: one is the impoverishment of the blood of its constant constituents, the red corpuscles, in consequence of the splenic affection

(hydræmia); the other is pigment-formation, to the mechanical significance of which in disorders of the renal circulation Frerichs has directed attention. The first of these conditions, however, he considers far more important, since cases with marked hydræmia and but little pigment-formation show decided alterations of the kidney, and, conversely, there is often found in extensive melanæmia long-persistent albuminuria, but only slight alteration of the epithelia. He has also observed a high degree of melanæmia without any sign of albuminuria. Rosenstein's explanation, however, is not satisfying, since decided renal disorder may manifest itself long before the malarial intoxication can have produced hydræmia to any extent, as is shown in the acute congestions of pernicious and very intense intermittent and remittent fevers, and also in the diffuse inflammations that are sometimes developed quite early in the course of the malarial disorder, as, for example, in three of the cases reported in this paper. It is, indeed, useless at present to attempt to decide whether the renal effects are due to a specific influence, to intensity, long-continuance and repetition of hyperæmia, or to the causes just mentioned. Hydræmia or pigmentary embolisms cannot be unvarying, though they may be occasional causes.

The form of malarial poisoning most prolific of renal inflammation is intermittent fever, for in it are to be found the conditions most favourable to its production, the often-recurring congestions extending over indefinite periods, during which the patient's powers of resistance are gradually reduced. In regions where pernicious and hæmaturic or hæmoglobinuric malarial fevers prevail, they will be found to excite most frequently the intense congestion that results in albuminuria, and, doubtless, occasionally inflammatory alterations of the kidney. Remittent fever may likewise produce identical changes. Although McLean (Reynolds's *System*, vol. i. p. 613) says of the urine in remittent fever that it very rarely contains albumen, abundant evidence is at hand to show that albuminuria of no small intensity is not so very unfrequent in this form of malarial fever. Hertz, for example, declares it to be no uncommon thing in the hyperæmia of remittent fever, when it may be accompanied with an abundant admixture of blood. Kiener and Kelsch found that the acute congestions and more acute forms of nephritis might perfectly well depend upon remittent fever; and Soldatow's observations resulted in the discovery of the alterations described by him only after the "severe forms of continuous and remittent malarial fevers." He did not encounter them at all after intermittent fevers. This want of agreement amongst observers relative to the comparative frequency of nephritis after the various forms of malarial fever can only be accounted for upon the theory that different epidemics exert unequal influences upon the kidneys, as has been stated in the earlier part of this paper. It also demonstrates that

no particular variety of malarial fever can be said to exert a specific influence upon these organs.

In the transitory albuminuria of ordinary malarial attacks, the prognosis is favourable, inasmuch as the symptom is usually due to the visceral hyperæmia alone, and disappears upon the subsidence of this. It is more grave in proportion to the intensity of the attack and the persistence of the albuminuria. Pernicious and hæmaturic and hæmoglobinuric malarial fevers are, of course, most dangerous, apart from their renal complications. In less severe but more chronic fevers the danger becomes proportionate to the extent of the damage to the kidneys. Generally, however, even in pronounced diffuse nephritis, the prognosis is favourable. Da Costa (*N. Y. Med. Rev.*, 17, p. 54) says: "I have seen a large number of cases of Bright's disease following malaria, and am therefore moderately familiar with the disease. By malarial albuminuria I mean a condition characterized by albumen in the urine, with granular and hyaline tube-casts coming on slowly, associated with dropsy, and as gradually passing away. In the long run and with proper treatment, such cases usually recover." As the symptoms of renal change become more chronic and pronounced, the prognosis will not differ from that of ordinary diffuse nephritis, and will become graver and more hopeless as the increasing structural alterations progressively impair the renal functions.

Axel Key first studied the pathological anatomy of renal alterations of malarial origin. (Cannstatt's *Jahresberichte der gessamt. Med.*, 1862, iv. p. 56.) The kidneys examined by him owed their changes to intermittent fever. They were enlarged. The interstitial tissue was commonly much thickened by cell-proliferation, which was also present in the tubules. He found amyloid degeneration constantly in the glomeruli and arteriæ rectæ, often also in the afferent arteries and later in the interlobular arteries. This latter statement needs confirmation. Rosenstein could not recognize amyloid degeneration as a constant form of renal disease after intermittent. Soldatow makes no mention of this degeneration in kidneys altered by remittent fever; while Kiener and Kelsch lay especial stress upon the *rarity, possibly the absence* of amyloid degeneration in malarial nephritis (*Arch. de Physiol. norm. et Path.* 1882, ix. p. 278). Soldatow observed in kidneys after remittent fever enlargement reaching sometimes twice the normal size. Scattered throughout the cortex were grayish-white nodules, sometimes 1 cm. in diameter. In the course of the affection, these nodules would diminish and finally disappear, leaving first a depression surrounded by extensive vascular injection, and ultimately a contraction of the cortex from scar formation. Microscopically, the epithelium was seen to be swollen, in places loosened, and later fatty degeneration. There was also extensive cell-infiltration of the thickened interstitial tissue. The endothelium of the capillaries was granular, its cells much enlarged, making the lumen smaller. Near the

glomeruli the vessels were filled with white corpuscles, and in places plugged by loosened endothelium. Later the elements exuded and underwent retrogressive metamorphosis, or new connective-tissue formation ensued. In 1873, Cornil reported an examination of the kidneys of two children dead of paludal cachexy. In these parenchymatous nephritis simply was present; the connective tissue was normal (Calmette, *Recueil des Mêmoires de Mêd. et de Chir. mil.* 36, 1880). The most extensive series of investigations of renal alterations of malarial origin were those of Kiener and Kelsch. The first-named of these authors first published the results of his investigations (Paludal Alterations of the Kidney in Algeria, *Comptes rendus de la Soc. de Biologie*, iv. 1879), and, subsequently, the results of their combined researches were given in a most elaborate article published in 1882 (*loc. cit.*). These investigations, extending as they do over the whole field of renal alterations of malarial origin, are such an important contribution to the literature of the subject that a somewhat extensive synopsis of them may be permitted.

They describe as paludal alterations of the kidneys: 1. *Inflammatory hyperæmia;* 2. *Glomerular* or *diffuse nephritis;* 3. *Nephritis "à granulations de Bright;"* 4. *Inflammatory degenerations of the kidney.*

Under the first heading are included, a. *Hæmaturic or hæmoglobinuric congestion;* b. *Hyperæmia with tendency toward sclerous induration;* and c. *hyperæmia with tendency toward epithelial hypertrophy.*

Hæmaturic or hæmoglobinuric congestion of the kidneys of persons who had rapidly succumbed to a pernicious attack with blood-corpuscles or hæmoglobin in the urine. Microscopically, such kidneys were very little altered in size or weight. An intense hæmatic coloration was most noticeable, obscuring the parts of the cortex, the glomeruli only being distinguishable as dark red points. The pyramids were of a brighter red. Microscopically was seen slight and uniform enlargement of the convoluted tubes and ascending limbs of Henle's loops, the epithelia being enlarged and discoloured. The tubes were filled with casts. The epithelia of Bowman's capsules of the glomeruli were tumefied and granular, and the glomeruli themselves often dilated in places and the seats of small hemorrhages. The interlobular veins and those of the limiting zone were dilated and their contents commonly thrombosed. The interstitial connective tissue was but little modified.

Hyperæmia with tendency toward sclerous induration was observed in kidneys of subjects dead of remittent fever of bilious or typhoid character or a pernicious attack consecutive to several relapses of fever, and whose urine had been albuminous and hemorrhagic or hæmoglobinuric. These kidneys were larger (300 to 400 grs.), red, smooth, and of almost normal consistence. Microscopically, in addition to the changes already noted, there were observed conditions which may be briefly summarized as consisting of three elementary lesions, plus hemorrhagic congestion. These

were: 1. Cellular proliferation tending toward fibrous transformation in the glomeruli; 2. Epithelial hyperplasia with atrophic tendency in the diseased tubules; 3. Diffuse sclerosis of the stroma. These lesions affected the cortical portion and especially the secretory elements.

Hyperæmia with tendency toward epithelial hypertrophy of kidneys of subjects dead, likewise, of pernicious fever, or of remittent fever of greater or less duration, whose urine had been highly albuminous, of a deep-red colour from blood-globules in suspension, and had contained "colloid" casts in the sediment. These kidneys were large, smooth, red, verging toward gray or yellow, with scattered stellate veins; the capsules tense and easily detached, cortex swollen and paler than the dark red of the pyramids. The pyramids of Ferrein were enlarged and of milky appearance, merging indistinctly into the convoluted region. Usually the colour was uniform, exceptionally pale, and shining patches were noticeable. At points the epithelia showed hæmatic imbibition. Another change, however, was predominant. The cells became two or three times larger than normal, almost filling the lumen, which was obstructed by moulds of colloid substance. There was but little interstitial sclerosis. The glomeruli were highly coloured, but did not tend toward fibroid transformation.

The second group of renal alterations they describe as *diffuse or glomerular nephritis*, and divide into acute and chronic forms. The *acute form* was always declared during an early period of the impaludism. It arose in the course of intermittent or remittent fever. In some cases the symptoms had been those of acute parenchymatous nephritis, death having occurred through increase of dropsy, or by inflammatory or gangrenous complications. Other cases had run a more irregular course. The *chronic form* could not be definitely distinguished from the preceding one. The lesions had developed insidiously in the course of chronic malaria, and were sometimes unexpectedly revealed at the necropsy. The kidneys were large, red, firm, and smooth; in more advanced cases they were small, preserving a smooth appearance and uniform red colour, and of firmer consistence. In other subjects the kidneys were atrophied, very hard, smooth or a little roughened on the surface, and of an opaque brown colour. Microscopically, there was shown a tendency of the renal parenchyma to develop an embryonic or fibrous connective tissue. Alteration of the glomerular elements was not second to glandular hyperplasia, but always independent of this, frequently primary and preponderant. The morbid process, rapid or chronic, general or circumscribed, at the start, merged from frank inflammation, with active cell-proliferation, to bastard and senile forms, in which the sclerous centres resulted from a slow hypergenesis of fibrous tissue with gradual atrophy of the glandular elements. There was a tendency of the nephritis to be limited to centres often very small and close together, and to produce there profound alterations.

(Compare with similar changes described by Soldatow.) These centres corresponded usually to a glomerulus or group of glomeruli. The sclerosis finally became diffused throughout the cortex. "Granulation" was not a result. Smooth induration or slight roughening was a persistent character of the process.

Nephritis "à granulations de Bright."—This form they also divide into acute and chronic varieties. The acute form is not named from the duration of the process, but as marking initial alterations. The authors were not sure that the clinical diagnosis between this and the preceding form of nephritis is possible. In the more acute cases the kidneys were remarkably pale, large, and soft (600 grs. in weight). The surface was smooth, and under the thin capsule showed a yellowish-white color with stellate veins. The cortex was very thick, pale yellow, shining, and moist. The authors here evidently refer to what is commonly known as the "large white kidney." According to them, however, "granulation" is already indicated at this stage. The peri-granular lesions showed the tubuli full, more or less, of indifferent cells, and contracted. The glomeruli sustained the same lesions as in glomerular nephritis. The intertubular connective tissue gradually thickened at the expense of the tubules. The *chronic variety* is described as having its perfect type in the small, red, granular kidney, which the authors consider as related by a series of intermediate stages to the big white kidney.

The final form of renal alteration from malarial influences is described as "*inflammatory degeneration of the kidneys, with cystic formation.*" This occurred in subjects who were cachectic and had succumbed to the effects of slow paludal poisoning with small doses frequently repeated and long accumulating. The lesions consisted in sclerous disorders of circulation, "colloid-fatty" degeneration of the epithelium, pigmentation, and cysts. The kidneys were atrophied (200–300 grs.). Sclerosis was the predominating process, forming bands dense, poor in cells, and but slightly vascular.

The conclusions of these authors are, that if we compare *paludal renal hyperæmia* with catarrhal nephritis in general, three facts are notable: 1, the tendency toward hemorrhage; 2, the intensity and rapidity of development of inflammatory phenomena, and, notably, of epithelial hyperplasias; and, 3, the rarity of fatty degenerations. *Paludal Bright's disease* they consider not very characteristic. There should be noted, however, 1, the tendency toward hemorrhages in all forms and at all periods of the nephritis; 2, the frank character of the inflammation, in contrast with the half-fatty, half-sclerous forms often presented by gout and alcoholism; 3, the rarity, possibly the absence, of amyloid degeneration.

It will be observed that Kiener and Kelsch do not recognize parenchymatous and interstitial nephritis as distinct morbid processes. While it is highly probable that granular kidney never occurs as a primary process

after malarial intoxication, but always when present represents some advanced stage of preceding diffuse nephritis, there can be but little doubt that one may encounter all gradations from transitory parenchymatous nephritis to chronic contracting interstitial nephritis, now tubal predominating over interstitial inflammation, now the latter form prevailing. In all cases the persistence of inflammatory changes during any considerable interval will inevitably lead to the involvement of the other renal structures. Therefore it may be concluded, that in the earlier stages tubal and diffuse nephritis will more commonly be found when the viscus is excited to inflammation by malaria, showing, it is true, a primary disposition to affect the glomeruli, but at the same time involving the tubules, and that as time elapses without subsidence of the inflammation, fibrotic contraction makes steady headway.

In the treatment of nephritic inflammation of malarial origin, reference must always be had to its intensity and duration. In the great majority of cases of hæmaturia or hæmoglobinuria and of simple albuminuria of transitory character, where diffuse renal inflammation has not as yet been excited, therapeutic efforts successfully addressed to the cure of the malarial poisoning will usually suffice to overcome the renal disorder as well. The vigorous use of quinine or other anti-periodic, if sufficient to avert an immediately fatal issue, will also restore the healthy condition of the kidneys. Certainly, during the prevalence of the malarial attack, nothing can be expected to control the renal hyperæmia that does not bring the impaludism under subjection. Even in those cases of diffuse nephritis where the attacks of ague sometimes assume that almost unmanageable form in which they will continue to recur in the most obstinate and unaccountable manner, no treatment can hold out promise of cure that does not strive for the subjugation of this influence, however feebly and irregularly it may manifest itself. Where diffuse nephritis persists after the malarial influence has been apparently overcome, treatment must be conducted as for ordinary diffuse renal inflammation; but regard must always be had for the possible survival of the malarial element and its possible recrudescence; and under no circumstance should a case of nephritis of malarial origin be treated without efforts to correct malarial toxæmia, not by the administration of anti-periodics in the doses and for the intervals ordinarily sufficient to overcome a simple attack of malarial fever, but persistently and in full doses. Under these conditions but little fear need be entertained of any possible injurious influence of the anti-periodic, for in the very rare cases where they seem to have exerted this influence over the kidneys, it has been by congestive hæmaturia apparently due to individual idiosyncrasy (Roberts, *Urinary and Renal Diseases*, Phila., 1872, p. 351; *Brit. Med. Jour.*, Jan. 1870). In all other respects malarial nephritis, whether acute or chronic, should be treated precisely as these morbid conditions should be treated, from whatever cause they arise.

Conclusions.—From what has preceded the following conclusions seem justifiable:—

1. Transitory albuminuria is not uncommon in the course of malarial fevers, and is due to the intense visceral congestions characteristic of these affections. It only may endure throughout the height of the congestion, recurring with each return of this, or it may persist in the intervals, in which event a higher grade of congestion is attained, more nearly approaching a condition of acute inflammation.

2. In a proportion of cases, varying with locality and type of prevailing epidemic, or individual conditions, inflammation of the kidney occurs, accompanied by dropsy and the usual symptoms of nephritis.

3. The usual form of malarial nephritis is the tubal and diffuse variety. In this the inflammation seems to be most intense in the vicinity of the glomeruli.

4. Contracted kidney may occur as an advanced stage of malarial nephritis either from long-continued or frequently repeated attacks of malarial fever, or from fibrotic changes such as may ultimately occur in ordinary tubal or diffuse nephritis. It is altogether improbable that this form of malarial renal disease ever occurs primarily as purely interstitial nephritis.

5. These changes may be induced by any form of malarial fever, though they more commonly follow chronic intermittent fever.

6. The tendency of malarial inflammation of the kidney is toward recovery. But from the persistence of the impaludism or the intensity of the inflammation, structural changes may be produced that are characteristic of chronic Bright's disease, when the gravity of the affection will be as that from chronic Bright's disease from whatever cause.

7. Treatment should be directed primarily against the malarial intoxication, more especially in recent cases. A correction of this will often be followed by a complete, though often gradual, subsidence of the nephritis. Even in more chronic cases, the malarial factor in the process should definitely be destroyed if possible, after which the disease should be treated as ordinary Bright's disease.

ARTICLE XII.

ACUTE YELLOW ATROPHY, RED ATROPHY, AND HYPERTROPHIC CIRRHOSIS OF THE LIVER.[1]

By J. H. MUSSER, M.D., Chief of the Medical Dispensary of the Hospital of the University of Pennsylvania, Pathologist to the Presbyterian Hospital

THERE are, perhaps, no diseases of the liver upon which there has been more discussion and speculation, than those named at the head of this

[1] Read before the Pathological Society of Philadelphia, March 13, 1884.

paper. Of rare occurrence, obscure in etiology, variable in symptoms, it is not surprising that they have excited so much interest. For these reasons no further apology will be required for presenting these studies to your consideration to-night.

In connection with acute yellow atrophy the clinical history of a case will be given very briefly, the appearances found after death described, and the histological changes discussed. Your attention will be especially invited to the determination of the question whether the degenerative changes are primary, or are secondary to an inflammatory process. After considering cirrhosis of the liver in general, and recording a case of "hypertrophic" cirrhosis, a description of the microscopical appearances of the liver will be detailed, the proper relation of this disease in nosology discussed, while the precise value of the histological changes, will be determined.

CASE I. *Acute Yellow Atrophy of the Liver.*[1]—A married woman, twenty-five years old, in the fifth month of her second pregnancy. In her former labour had puerperal convulsions. The presence of this pregnancy was attended by extreme mental depression on account of fear, to such a degree that she resorted to means to provoke abortion. The decided symptoms of acute yellow atrophy of the liver, which lasted six days, were preceded, by some weeks, by a slight catarrhal jaundice. It is rather irrelevant to detail any more of the clinical history, and therefore at once brief notes of the autopsy will be given. The tissues were bile-stained, ecchymoses under the skin were abundant, and the blood was liquid and of a dark mahogany-red colour. The abdominal organs alone were examined. The spleen was slightly enlarged. The kidneys were enlarged; capsule removed easily; stellate veins and capillary circlets enlarged; tissue bile stained and congested; cortex enlarged. On microscopical examination the organ presented the changes of chronic desquamative nephritis with congestion. The liver was found high up and against the vertebral column, separated from the anterior thoracic wall by intestines. It was about one-half its natural size, very soft and flabby; its capsule was wrinkled. Large areas of the external surface were of a mahogany-red, and larger, a yellow colour. On section, the red portions looked not unlike the blood-red coloured pulp of oranges we often see; the yellow were of the characteristic ochre or rhubarb shade. The red appeared congested, the yellow anæmic. In the latter areas the outlines of the lobules were effaced, although the site of the hepatic veins were shown by dark-red puncta. The gall-bladder was small and contained a teaspoonful of olive-green bile. The ducts were empty and patulous. The report further reads that on microscopical examination, "in some areas, the cells of the lobules, were not much degenerated, but all contained one or more oil-globules. In most lobules, however, the cells of the periphery were markedly changed; globules of oil in abundance, shrivelled cells, free nuclei, and numerous lymphoid cells replaced the normal liver cells. Some of the lobules were entirely destroyed. In some a marked infiltration of lymphoid cells in their periphery was noted. The portal vein appeared normal; the hepatic showed cell infiltration. The walls of the hepatic artery were thickened. The hepatic ducts were filled with epithelial cells and the walls thickened. No crystals of leucin or tyrosin were found, but here and there hæmatoidin.

The above is the description of the microscopical picture as seen when the report of the case was made. Lately the sections have been studied again very carefully, and some fuller statements can be made. Thus in some fields, in fact in the larger number of instances, the cells were less affected

[1] See Trans. Phila. Co. Med. Soc. 1882-1883.

in the portal than in the hepatic zone of the lobule, although the infiltration of leucocytes was much greater in the former area. This infiltration was so excessive that it amounted almost to a new formation of young connective tissue. In some of the intra-lobular meshes blood corpuscles as well as leucocytes were seen. In some areas the destruction of liver cells had not begun; in others they showed cloudy swelling. The assertion above, "that the portal veins appeared normal, the hepatic showed cell infiltration," was a misplacement of terms, and should be so changed that hepatic would take the place of portal.

It may be asked what is the relation of this enormous accumulation of lymphoid elements? Is it the primary, and the degenerative the secondary change? Is, in other words, the disease of the liver a diffused inflammation, or is it a fatty degeneration? This is the ground upon which many battles have been fought; in fact the war is still waging; the question is still unsettled. In the report of the above case it was said that the changes were due to a diffused hepatitis. And so at first blush one would think. That such a view is not tenable, the following proposition would seem to uphold.

It is well known that the liver, of all organs save the spleen, is most distensible without its structure being affected, and the cells can undergo a high degree of pressure without degenerative changes in them. Now the amount of exudation is so slight in acute yellow atrophy that it would not be possible to have deleterious influence on the cells; hence one would infer their primary destruction. The liver is highly anæmic in appearance to the naked eye, and a study of a section, as in the above cases, shows an absence of blood in the vessels—sufficient cause, with the primary blood-poison, to excite the acute necrosis. That the necrosis is the primary change is all the more likely when it is remembered that the only plausible explanation for the occurrence of exudation in a bloodless liver is because of the removal of the support of the vessels, and resistance to the blood-pressure by the destruction of the cells. A further reason for the degenerative process being primary may be found in the fact that a similar process takes place in other organs of the body, notably the heart and kidneys. Finally, the histological appearances of the two distinct portions of the liver seem to indicate their sequence to the destruction of the liver-cells. The yellow-coloured portion has been described; sections of the red show greater destruction of the liver-cells, a greater thickening of stroma, and a preponderance of cell-infiltration. Within the lobules there is a network of connective tissue, the meshes of which are filled with granular *débris*—pigment granules and nuclei. Legg has shown that the amount and degree of the red atrophied portion depend entirely upon the duration of the disease, and all authorities agree that it represents an older disorganization than the yellow portion. For these reasons, therefore, it is no doubt true that the fatty degeneration precedes

any cell-proliferation; that whatever degree of cell-proliferation is present, it occurs secondarily, and the amount of it depends upon the extent of the primary necrosis.

Many observers call attention to the presence of new ducts, and some to a "regeneration of the liver-tissue taking place from the bile ducts."[1] These appearances were not noted in the above case. The latter statement is so unphysiological that the condition is not likely to have a pathological existence. Reference will be made to the presence of these ducts when speaking of hypertrophic cirrhosis. Bacteria are said to have been found in this disease, and to one species—the Microsporon septicum—has been attributed all the trouble. Dr. Formad called my attention to the presence of colonies of micrococci in the veins of some of the sections; otherwise they would have been overlooked.

Red Atrophy of the Liver.—Some confusion appears to exist at the present time regarding this affection. Formerly it was applied to an atrophic degeneration of the liver, following organic heart disease, an advanced nutmeg-congestion. Now the term is applied to the latter stages of acute yellow atrophy,[2] while brown or chronic atrophy is the name given to the liver of chronic heart disease. The writer presented to the society the only specimen of this disease that has been reported. The rarity of the affection is sufficient apology for recurring to it.

CASE II.—The organ was diminished to two-thirds its size, weighing one pound thirteen ounces; the left lobe was somewhat enlarged, however. The tissue was firm on pressure, unevenly yellow-tinged, and on section was of a nutmeg appearance. On microscopical examination, the atrophy was more marked around the hepatic venules, where the liver-cells were replaced by a mass of reddish *débris*. At the periphery of the lobules the cells were much less affected, while the increase of connective tissue was marked, both of old and young.

Save the absence of fat globules in the section, the picture much resembles one of acute yellow atrophy. The clinical history forbids any conclusion of such character.[3]

In addition, the hepatic vein is always found dilated, while the intralobular capillaries are much increased in size—conditions not present in yellow atrophy.

Hypertrophic Cirrhosis.—Cirrhosis of the liver was formerly limited to that chronic inflammation of the connective tissue which accompanied the portal vessels in their distribution, and which was inter-lobular. In addition to "multi-lobular" or "alcoholic" or common cirrhosis, we now include under the term cirrhosis "biliary" or "mono-lobular" or "hypertrophic" cirrhosis, and syphilitic cirrhosis (congenital). Described first by some German observers,[4] attention was only directed to hypertrophic cirrhosis after the investigations of Charcot and Gombault and of Wickam

[1] Legg on the Bile, etc., p. 512, Report of Waldeyer's Case.
[2] See Goodhart, Atlas of Pathology, Liver Diseases, Sydenham Society Trans.
[3] See Path. Trans., vol. x. p. 95.
[4] See Ziemssen, vol. ix. p. 211.

Legg. It is called "biliary" cirrhosis because the condition is supposed to follow an obstruction to the bile-ducts higher up in their course or at their terminations. The gentleman just mentioned produced the characteristic changes by ligating the ducts of animals, while they assert that similar changes are found in obstruction of the common duct or chronic catarrh of the finer ramifications of the ducts. It is called "mono-lobular" cirrhosis, in contradistinction to multi-lobular cirrhosis, because, while in the latter islets of lobules are inclosed in the connective tissue, in the former single lobules are thus inclosed, while the lobules themselves are invaded by the new growth (intra-lobular), causing atrophy and often complete destruction of the hepatic cells. It is called hypertrophic cirrhosis because the liver is invariably found enlarged.

The following case, which has never been reported, is worthy of study in this connection. The abstract of the clinical record of Dr. Hughes is first given:—

CASE III.—This case was admitted to the University Hospital in October, 1882. A married woman, thirty-nine years old, intemperate (malt liquors), of bad moral character, free from syphilis as far as her testimony determined, without knowledge of her family history, of previous good health, noticed, one year before admission, gradual enlargement of the abdomen. She had previously had for years dyspeptic attacks. She did not know when the enlargement began, and had with it dull hepatic pain. Dyspeptic symptoms increased, and the past eight months she vomited after meals. Appetite poor for many months. Lost flesh and strength; had epistaxis occasionally; abdominal and hepatic pains continued, menstruation ceased six months. During the two months before admission, slight jaundice developed and increased in intensity, and yellow vision was observed. When admitted she was jaundiced, and the arterioles of her cheeks injected. Tongue red on edges, dry and brown on dorsum; sordes; constant thirst; poor appetite; weight, fulness, and pain after eating, with acid bilious vomiting at times. Diarrhœa for two days; formerly constipation. Ascites; enlarged liver (third interspace to two inches below ribs), hard, surface rough, edges rounded. Enlarged superficial veins. Urine dark; sp. gr. 1015; contains albumen and granular casts and bile-pigment. She died the sixth day after admission, having been semi-comatose forty-eight hours before death. The first day of admission, twenty-seven and one-half pints of fluid were removed from the abdomen by paracentesis.

Hypertrophic Cirrhosis of the Liver.—This abstract of the notes of the autopsy, three and a half hours after death, is taken from the record in the University Hospital.

External Examination.—No rigor mortis; intense jaundice; the whole body of uniform deep orange-yellow tinge; sclerotic coats of eyes also deep yellow; pupils widely dilated; marked discoloration of the whole posterior part of body; no emaciation of body; adipose tissue well preserved, or rather in excess, and of unusual soft and flabby character; abdomen greatly distended with ascitic fluid; no œdema elsewhere.

Thorax.—Heart and pericardium normal. Lungs normal. Some right-sided chronic pleurisy, with a few slight adhesions, both diaphragmatic and parietal, and with moderate effusion on corresponding side.

Abdomen.—Eight quarts of a deep-yellow, perfectly clear fluid in peritoneal cavity. Omentum normal, but with enormous deposition of fat.

Liver protruding five inches below lower border of ribs; very marked perihepatitis, with strong adhesions; the organ is uniformly and much enlarged (about one-third); weight, with pancreas together, 3000 grammes. Surface rough, granular, like in ordinary cirrhosis; colour deep orange-yellow, and uniform on section; consistence firm, but not as hard as usual in cirrhosis; the parenchyma is rather elastic; gall-bladder distended and filled with a thin, mucous, pale-yellow, viscid fluid, substituting the bile; gall-duct nearly obliterated—a probe could be passed through it only with great difficulty; the mucous membrane of gall-bladder and duct is thickened and the seat of catarrhal inflammation. (See Microscopic Report.)

Spleen enlarged, congested, tough in consistence; weight, 265 grammes.

Kidneys presented the appearance of chronic catarrhal nephritis.

Microscopic Appearances of the Liver.—The connective tissue predominates in quantity (bulk) over the liver-cells. This large increase is mainly intra-lobular, or rather inter-*cellular*, separating widely each individual liver-cell from the other in nearly the same degree as the lobules are separated by the likewise increased inter-lobular connective tissue. The picture is a peculiar and rare one. The liver-cells are so isolated that the general aspect of our liver section under the microscope is not unlike that of cartilaginous tissue, only a less regular distribution of the cells. Further, it is seen that this sparseness of liver-cells is due to the latter being partly atrophied and partly directly pushed asunder by the mentioned development of inflammatory connective tissue. Only in some places an indication of the lobules can be made out by the portal vessels and the hepatic arteries. In some fields connective tissue only is seen, in others small groups of liver-cells. The remnants of a liver lobule may be recognized. The bloodvessels are mostly empty; their calibre is diminished, or even obliterated in many places. The muscular wall of all larger vessels is attenuated, while the adventitia is rather thickened. The bile-ducts and its capillaries are catarrhally inflamed. In character the overgrown connective tissue, which is of the dense fibrillar and areolar variety, appears like one of old standing. The liver-cells proper are highly granular, so that the nuclei cannot be recognized; the polyhedral shape of the cells is lost. The cells are mostly atrophied and disfigured; some are stretched and elongated-like, from lateral pressure. Many of the cells, and even larger areas of liver, were deeply pigmented with bile. Fatty infiltration was observed nowhere.

In addition to the microscopical appearances in this very complete report, in many fields within the lobules *new* ducts could be seen, both in transverse and longitudinal section. These ducts were lined with nucleated epithelium in all instances. Their mode of origin could not be determined.

The symptoms of the so-called hypertrophic cirrhosis are generally even more decided than that of the atrophic form, and cover a much longer period of time. Jaundice being generally the exciting cause, precedes any other symptoms. These are dyspeptic at first, accompanied by pain in the region of the liver. With the pain the liver enlarges, but the

outline is smooth and hard. The spleen enlarges almost invariably. Ascites is not the rule, but occurs. Hemorrhage from the nose is spoken of as a frequent symptom. The duration of the disease is seldom under two years, and may last as long as twelve. Death is generally preceded by coma. The clinical notes of the preceding case correspond very closely to the summary of symptoms. Could it not be said, however, that, save the increase in the size of the liver, there are many cases of atrophic cirrhosis which present the same symptoms also? If one hundred cases of cirrhosis of the liver are analyzed about one-third will be found to agree well with the usual clinical and anatomical description. The remaining two-thirds can be divided into many varieties, clinically speaking, and one of these would surely include cases corresponding to the above case.

Referring to the macroscopical appearances, one finds that the liver is increased in size, the surface smooth, the capsule opaque and thickened, while the cut surface has a finely granular appearance, and single lobules are inclosed in new connective tissue. A microscopical examination of the organ reveals changes similar to those which have been described in the case just recorded—intra-lobular connective tissue and abundant canaliculi.

There are some, especially the German physicians, who deny to pathologists the right to call this a distinct disease. Arguing from the case recorded to-night, one would think it a matter of fine distinction to separate it from, to say the least, interstitial hepatitis. It is impossible, for instance, to find much difference between it and the case (No. LIV.) recorded by Murchison in his classical work, in the chapter on the latter disease. Clinically, the case appears to be one of ordinary cirrhosis, and, to the naked eye, the liver would be classified as of that affection. Histologically, however, the lesions of the atrophic form are found, and more, too, new ducts (probably) and intra-lobular connective tissue.

It is to be remembered that the term biliary is applied to those forms of cirrhosis which are due to long-continued obstruction of the duct, while the term "hypertrophic" is applied to a similar hepatic change due to alcoholism or to previous infectious diseases (Thierfelder); and that both present the same histological appearances.

Now opposed to the occurrence of biliary cirrhosis, is the fact that in the many cases of obstructive jaundice, while there is generally slight nuclear excess, it is the exception to find the change of this special disease. It is true that Legg,[1] by tying the common duct, has found that such changes take place, but the control experiments of Litton entirely oppose his conclusions. It is rational to suppose that irritation of the ducts would start cell-proliferation. The remarks of Friedlander, however, that epithelial worry is more likely to lead to atypical development

[1] Legg, op. cit., p. 341 et seq.

of epithelial cells, is just as rational and probably more frequently found in practice. Do the histological appearances have any special significance? The apparently new development of ducts is not peculiar to this affection, but is found, according to Goodhart, in acute yellow atrophy, in the nutmeg liver, and in cancer and tubercle of that organ, and in cirrhosis, especially in its active stage. While, on the other hand, the intra-lobular overgrowth of connective tissue is found not only in hypertrophic or biliary cirrhosis, but also in the hepatitis of congenital syphilis. Woodhead has a plate in his new book, illustrating a section of the latter disease, which could be taken for one of hypertrophic cirrhosis.

The appearances which seem to indicate an increase of the biliary canals has been explained in many ways. Time will not permit an examination of these questions. An admirable *résumé* of the various views by Goodhart may be found in the Sydenham Society's publication. It may be remarked, however, that the simplest and more plausible explanation is that of Brüger. He considers the appearance to be due to the bile capillaries, which are rendered more distinct by the atrophy of the liver cells, and we would add, *by previous dilatation from obstruction.*[1]

To conclude, one is warranted in saying this and no more, that there are several affections of the liver which appear to have an arrangement of the cells simulating biliary canals, and hence that there is a new development of these canaliculi, or an increase in their size; second, that there are some affections of the liver (mono-lobular cirrhosis, and congenital syphilitic hepatitis) which show an increase of connective tissue within the lobules (intra-lobular); third, that the connective tissue is practically a lifeless one, and hence does not undergo contraction and reduction in the size of the organ; fourth, that rarely, in some forms of alcoholic hepatitis and in hepatitis secondary to biliary obstruction, these histological changes are presented. With such data, would one be justified in dignifying such a combination of changes with a new name?

While they are said to differ clinically, it seems that this difference is only relative. In the first place, jaundice must be excluded as a symptom, as it is the effect of the cause of the hepatitis, developing *pari passu*, or is a cause itself. Then again, if we take a large series of cases of cirrhosis, we would be enabled to arrange them into many classes from the varying symptoms, and doubtless many would conform, in symptoms, to hypertrophic cirrhosis. Actually, enlargement of the liver and of the spleen, and the long duration of the disease, are the only distinctive symptoms. And even the latter is relative, for who can tell how long an atrophic cirrhosis had been in progress? For accurate diagnosis, one would say,

[1] The writer has recently studied with Dr. Hughes sections of a liver which had undergone the changes of a hepatitis, due to congenital syphilis. In these sections the appearance of new ducts was very distinct as well as the decided increase in intra-lobular tissue—presenting in fact the histological change of a hypertrophic cirrhosis.

if in a case of jaundice we have sequential enlargement of the liver and spleen, there is, in all probability, that form of interstitial hepatitis which has its prototypes in congenital syphilitic diffused hepatitis.

In the *Transactions of Path. Soc. of Phila.* (vol. viii.) a case is recorded by Dr. Guiteras, which the writer had the pleasure of studying with him. It was diagnosed during life as "chronic catarrhal jaundice, resulting in hyperplasia of the connective tissue." The jaundice was of ten months' duration, the liver and spleen were enlarged, ascites was absent, emaciation and gastro-intestinal symptoms were marked—clinically representing a true biliary cirrhosis, yet on microscopical examination of the liver, it was found that the connective tissue in the inter-lobular spaces alone was decidedly increased, and infiltrated with embryonic cells.

Such frequently conflicting clinical records and histological changes only go to show that only the most liberal construction can allow one to evolve a new disease out of such heterogeneity. The writer is one of those who believe that its close alliance to the ordinary sclerosis forbids one giving hypertrophic cirrhosis the distinction of a separate place in nosology.

ARTICLE XIII.

A CASE OF LEFT INGUINAL COLOTOMY FOR IMPERFORATE RECTUM; RECOVERY.

By W. H. HAYNES, M.D., of New York.

ON the night of September 5, 1882, I was summoned to see the fourth child of Mrs. A., who had been born on the afternoon of the 3d, in consequence of its not having had a stool since birth. Upon arriving at the house, I found a male child apparently not suffering, and without any external marks of abnormality. Domestic cathartics had been administered without success, and the midwife, on attempting to give a warm soap-water enema, found that the nozzle of the syringe could be introduced within the anus only for a short distance, and the fluid injected immediately returned without causing a fecal evacuation. Proceeding to examine, I found I could only introduce the tip of my little finger within a naturally formed anus for about half an inch, into a cul-de-sac to which there was but one opening—that of entrance. Nothing distinguishable could be made out beyond the limiting membrane in the abdominal cavity. In other respects the child was perfectly natural; nursed, did not vomit, slept, and urinated. The condition of affairs was explained to the parents, who were warned against using any evacuant measures, but, if necessary, to administer small doses of paregoric p. r. n.

The next morning the child was seen by Prof. Van Buren, who gave the opinion that the best procedure in this case was left inguinal colotomy. That night the child was restless, cried, and vomited a little curdled milk.

On the 7th of September, just before noon, in my office, assisted by Drs. Hathaway, Church, and Busche, the child being four days old, was

chloroformed so that a thorough examination could be made previous to operating. It had urinated just before coming to my house. The abdomen was noticed to be more distended and tympanitic on the left side, but no tumour could be detected. The anal cul-de-sac was examined by finger, probe, and by sight, through an ear speculum, without finding any internal orifice. It was thought by some of the gentlemen present, that a doughy mass was distinguishable upwards and to the left side of the pelvic cavity. A trocar was carefully thrust in this direction, through dense unyielding tissue, as far as was thought justifiable, but nothing came through the canula. I then proceeded to open the colon in the left groin. An incision one-and-a-half inch long was made just above and parallel to Poupart's ligament. The different layers of adipose and muscular tissue and peritoneum were laid open on a director. One vessel required a ligature; I then introduced my finger into the abdominal cavity, traced up the colon (which was empty) from below, and, with a pair of thumb forceps, drew out the part nearest the wound. It was held fast by two ligatures, drawn out of the wound, an opening made giving exit to some gas and meconium, and the edges of the wound in the intestine united by a number of sutures to the wound in the abdominal wall. The parts were cleansed with a warm, weak solution of carbolic acid and water, and the same was used throughout the operation for hands, instruments, and sponging. A piece of lint spread with vaseline was placed over the wound, and a diaper over that completed the dressing. The time occupied in the examination and operation was a little over an hour. When I saw the child at its home in the evening, it had considerable fever, rapid pulse, and would not nurse. Two large stools had escaped from the upper opening of the gut in the wound.

8th, 10 A. M. Temperature 99°; pulse 110. Has had another stool since last visit; nursed a little; slept though very restless. Abdomen swollen, particularly the parts around the wound, which is also very much congested and tender. Has passed no urine. Ordered a mixture of aconite, paregoric, and nitre. In the evening there was less fever, pulse 120; slept all day; had two stools; urinated, and nursed without vomiting.

9th, A. M. No jaundice; has slight fever; is bright and lively; slept well; nursed without vomiting; had stools and urinated. Abdomen softer, parts about wound less swollen and congested. Applied a salve of iodoform, bals. Peru, and vaseline to the wound, first cleansing it, after each stool. P. M. No fever; pulse 110; nursing, sleeping, etc., the same as any baby in health.

15th. Improvement continues. The ligature from off the vessel came away yesterday, and some of the sutures have been removed.

26th. The baby has been suffering from indigestion, giving rise to diarrhœa, crying, and straining, and causing prolapse of the gut at the upper end of the wound, and oozing of some blood. The sutures have all been removed, and the wound is entirely united.

30th. Under chloroform, and after urination, a sound was passed into the lower opening of the gut in the wound downwards and backwards, till its tip could be readily felt by the finger within the anus, seemingly only separated by a thin partition of tissue. A crucial incision was made, allowing the end of the sound to emerge at the anus, and the opening dilated with a small, soft urethral bougie and open forceps. A coil of lamp wick was passed through the natural and artificial anal openings to serve as a guide for future measures.

October 12. A bougie, No. 24 F., can be passed through the rectum and into the abdominal opening. Feces pass at both natural and artificial openings.

31*st.* The child's general condition is very good. A metal pad and rubber bandage closes the artificial opening, restraining the passage of feces and prolapse of the intestine, so that all stools occur at the natural opening, which also allows of a free passage through the rectum of a large sized bougie. Dilatation was continued till I could pass the first phalanx of my index finger through the new rectal canal. During this time the abdominal opening had contracted over one half its original extent. I attempted to close it by paring the edges and uniting them with silver wire, but the sutures tore out, and no union was obtained.

On *December* 10, 1882, the case was dismissed. All stools passed by the natural opening. The abdominal fistule was very small and covered by a metal pad and bandage. The mother was instructed to pass her finger through the rectum daily.

August 2, 1883. The child is now eleven months old. Its skeleton has grown but its body is emaciated. Has the four first incisor teeth, and getting the others. The parents have neglected to keep up dilatation of the rectum, so that now there is only a fistulous passage; all stools passing through the abdominal opening. This was the last time I saw the child. I afterwards heard that some time after I saw it the child was taken with convulsions ascribed to teething and died.

"Embryologists tell us that, during the early development of the fœtus in the process of budding from the hypoblast, by means of which the various abdominal organs are envolved, the bud that branches towards the anus to form the rectum is sometimes arrested in its progress, so that it fails to meet the bud from the epiblast which forms the anus, and the result is an interval in which the rectum is wanting, either a mere partition, or bulkhead or a distinct space intervening, varying from half an inch in length, usually occupied by a fibrous cord."[1]

The above description succinctly states the nature of the deformity in that variety of imperforate rectum where the anal opening is properly formed, and in which class our case would be placed.

As showing the effect of hereditary influence in these cases which is similar to that seen in all the other congenital deformities, I cite the following remarkable instance reported by Dr. Githens to the Obstetrical Society of Philadelphia:[2] where the same parents had two children so deformed, and the mother's maternal aunt had had five out of seven children deformed in like manner. All these seven children perished, two after operations for their relief. What a stimulus this striking record of mortality should be, causing us to strenuously increase our efforts to seek out the best and safest methods of achieving success in these unfortunate cases.

The symptoms presented in our case were simply those of the non-performance of an important function, which is the only evidence ever presented in the early stages of this malady, and should cause us to make

[1] Van Buren on the Rectum, revised edition, 1881, page 367.

[2] Medical News, vol. xli. page 532.

diligent examination for this deformity. This, I am sorry to say, is often neglected till grave constitutional symptoms present themselves, which make an unfavourable prognosis a foregone conclusion. This latter train of symptoms often sets in early (after the first few days) on account of the tender nature of these young children, whereas an early operation is half the cure. The diagnosis of this condition is so easy that it can be made by non-professional persons, as happened in this case, where the midwife, whose intelligence I must say is above the general average of midwives, had correctly made out the condition. The prognosis is undoubtedly fatal unless relieved by art or nature. Nature sometimes relieves these patients in one of two ways: either by ejecting the excrement matter through vomiting, or by the formation of a fistulous opening before birth, generally in connection with one or the other of the adjacent canals. Noteworthy examples of these two modes of nature's cures are the following: "Mr. Cripps reported to the Pathological Society of London[1] the case of a child thirty days old with imperforate rectum, who was apparently quite well, food being well taken and fecal matter vomited three or four times a day;" and Curling mentions a case alive after twelve weeks of such existence.[2] Dr. Fenwick of Montreal, at the last meeting of the Canada Medical Association,[3] narrated the case of a man who all his life had defecated through a fistulous opening which was situated at the root of the penis, and which communicated with the rectal tube. Other cases of this latter nature could be given, particularly as occurring in female children.

The different plans which art has devised for the treatment of the various forms of rectal deformity found at birth may be classified under three general heads:—

1. Perineal puncture and dissection, including Verneuil's operation of extirpation of the coccyx.
2. Lumbar colotomy.
3. Inguinal colotomy.

Their different uses are so well discussed in the later works on surgery, and particularly in the latest monographs on this special branch, that I will not stop to discuss this part of the subject, simply stating that the treatment pursued in this case will be found to be in accordance with the rules laid down by these authorities, and with the eminent counsel we had to guide us before proceeding to operate, and that the result will add its testimony to the weight of opinion in favour of the operation performed. I found it to be simple, to be easy of performance, and to give immediate access to all the parts concerned.

The result is the more surprising when the bad social and hygienic surroundings of the child are considered. Its parents were of the lowest

[1] Lancet, May 15, 1880.
[2] Curling on the Rectum, edition of 1876, page 224.
[3] Medical News, vol. xliii. page 303.

order of society, very poor, living in such a wretched habitation as to be unfit for the performance of the operation, and they were constantly hoping death would release them of their burdensome charge. Only the commonest antiseptic precautions were observed without the spray. One circumstance that materially aided in the obtaining of so favourable a result was the early performance of the operation, before the usual evidences of debility from distress and suffering had shown themselves. This record adds another successful case to the short list given in the American edition of Holmes's *System of Surgery*, 1882, vol. iii. p. 851, where is reported the only other successful case since 1859 by Dr. Pooley, who operated for imperforate rectum with a vaginal fecal fistula.

One procedure in the treatment of this case I do not find discussed anywhere in detail, namely, that of opening up a passage at the natural site for the canal, either simultaneously or subsequent to the operation opening into the gut. Where the two operations are to be performed at the same time, the first or inguinal opening is in the nature of an exploratory operation, and should be made small so as to admit of immediate closure, and return to the peritoneal cavity after a passage is secured at the natural site. If this latter is not secured, then the opening could be enlarged and made to serve the purpose of an artificial anus in the abdominal wall. The advisability of this procedure, however, is at present very doubtful, which only the experience of a number of operators can determine. Of the few cases so far undertaken in this manner that I can find recorded, my own case is the only one that survived the second operation. The other cases so treated were two by Owen, the latest and best authority on this subject, both of which died after successfully surviving left inguinal colotomy.[1] He graphically sums up his experience in these cases as follows :—

"Granted, then, that an artificial anus must be performed, let the groin be opened, and let no sharp instrument be at any time blindly thrust upward into the interior of the pelvis through the carefully performed dissection in the perineum. Let there be no delay, no waiting for symptoms, which in tender babes are but the beginning of the end; no expectation of a manifest bulging of the upper piece of bowel. It may never become filled at all, for, as in one of my cases, the meconium may grow firm and scanty from an absorption of the watery part; and should the operation be a success as regards saving life, at least let there be something more than hesitation at the subsequent proposal to attempt the construction of another artificial anus at the most convenient site."

My own single experience, though successful, does not lead me to advise this procedure, for the object of it will, during the early years of its life, be dependent on the exceedingly diligent and constant attentions of others whose affections and services, though the closest, are not to be depended on, as was demonstrated in my case. If the second operation is subsequent to the first, he will have a double annoyance, or be under

[1] Harvelan Lectures, 1879.

the necessity of having a third operation performed for the closure of the opening first made, which is not unattended by danger to life or by doubts as to the result, and perhaps be under the necessity of having it reopened from neglect in the proper after-treatment of the new canal in the natural site. Whereas, if one is satisfied with having saved life in a manner which, as numerous cases testify, is not unenjoyable or full of discomfort, as used to be maintained, all dangerous risks of subsequent operations are avoided, there will be no more dependence on other's services than is natural, and many sources of distress that natural flesh is heir to will be obviated.

ARTICLE XIV.

SCARLET FEVER IN CHILD-BED. By THEOPHILUS PARVIN, M.D., Professor of Obstetrics and Diseases of Women and Children in Jefferson Medical College, Philadelphia.

THE very interesting paper by Dr. Busey, in the last number of this Journal, leads me also to record a case of scarlatina occurring in a woman soon after labour. The case occurred during my service as a member of the Obstetric Staff of the Philadelphia Hospital, and the following report is made by Dr. Arthur A. Bliss, one of the internes who had charge of this patient.

Mary O'D., a domestic, twenty-one years of age, belonging to a healthy family, and having herself had good health, was delivered of her first child after a normal labour, on Monday, March 4, 1884. Her condition was satisfactory until the afternoon of March 6th, when she had a slight chill, which was followed by a rapid rise in temperature from 99° A. M. to 103.4° P. M. She complained of severe headache, and of pains in the neck; the lochial discharge was normal, the secretion of milk which had begun was arrested. The next morning she was quite comfortable, but her evening temperature was 103.3, and as puerperal septicæmia was prevailing in the lying-in wards of the hospital, she was transferred to the ward for these patients. But the next morning a scarlet rash was observed upon her neck and shoulders; by the next day this rash presented so distinctly the characters of the eruption of scarlatina, and no symptoms of septicæmia being present, she was removed from the fever ward to a private room. On the ninth of March the eruption had extended over the entire body; she complained of pain in the fauces, and her tongue had the characteristic "strawberry" appearance. On Monday, March 11th, she suffered much from pains in the hands and wrists, and they were slightly swollen, but the pain was relieved by wrapping them in lint saturated with laudanum and warm water. The lochial discharge at this time was scanty, bloody, and somewhat offensive. March 13th desquamation was observed to begin; it was noticed first upon the neck, but soon extended to all the body, and to the limbs. There was observed in the lochial discharge an organized mass of matter about an inch square, and after this the flow ceased to be offensive. On the fifteenth of March, albumen was first found in the urine, but the quantity was very slight, and after a few days disappeared. She had bronchitis when she first came into the lying-in ward, and this trouble was renewed during her convalescence from scarlatina, delaying somewhat the convalescence. The striking features of the case were chill followed by rapid elevation of temperature; a scarlatinous eruption upon the entire body and

limbs, pharyngitis, strawberry tongue, and rheumatoid pains in the wrists and hands; general desquamation and albuminous urine.

The patient was given four ounces of lime-water and milk every two hours; at first an ounce of whiskey every two hours, afterwards but half an ounce every three hours. While the temperature was above 100° the body and limbs were sponged with carbolized water three times a day, and after each sponging carbolized cosmoline rubbed upon the surface. The bowels were moved once in thirty-six hours by enemata, when there was no spontaneous movement.

Of course there can be no question as to the diagnosis of the disease, nor any question as to its favourable course undisturbed by the puerperal state; it was simply a case of scarlatina occurring in a lying-in woman, not a case of puerperal scarlatina, apparently neither giving to nor taking from the puerperal state any danger. For the first twenty-four hours of her illness she was in a ward with eight women who had recently been delivered, and then for the next twenty-four hours in a ward with five septicæmic women; but she did not give scarlatina to the former or to the latter, nor did she get septicæmia from the latter.

But whence did the scarlatina come? The patient had not been out of the hospital for several weeks; she had friends visit her, but there was no scarlatina in the families of any of these. Four months before she was taken sick, one of the convalescents after confinement had the disease, but this patient was not with her. An incubation too of the poison for so long a time can hardly be admitted. The truth is, every practitioner of large experience has met with cases of scarlatina in which he fails to ascertain the origin of the disease. I confess my ignorance in this case as to the source of infection. It is to be remembered, however, that the period of incubation of scarlatina is very short in puerperal women, the observations of Senn and Hervieux proving it to be but from twenty-four to forty-eight hours.

Sir James Paget has pointed out the fact that the wounded in consequence of their condition, independently of all septicæmia, are more susceptible to scarlatina. It has been suggested that in like manner the puerperal state gives a receptivity—increases the susceptibility to the germs of this disease. This seems a much more probable supposition than that pregnancy creates an immunity from the disease, an immunity which is not claimed for this condition as to any other acute infectious disease. But this alleged insusceptibility of the pregnant woman to scarlatina is contradicted by Hervieux,[1] who says that he has seen scarlatina at the sixth month of pregnancy, causing abortion during the eruptive stage, and that a similar case has been recorded by Dance. He adds that many cases of scarlatina in pregnancy have escaped being so considered by their causing premature labour, and thus being classed as the scarlatina of puerperality. Legendre,[2] in his study of the subject, regards lying-in women

[1] Maladies Puerpérales, 1870.

[2] Étude sur la Scarlatina chez les Femmes en Couches, 1881.

as peculiarly liable to the disease which in them is frequently irregular in its evolution, and states that puerperal scarlatinoid, and the so-called scarlatiniform exanthemata are most probably simply mistaken scarlatinas. Siredey[1] regards puerperal women as peculiarly susceptible to the scarlatinal poison; they have a predisposition to the disease, but this disease is always of external origin, and it is not more the effect than the cause of the grave accidents of puerperal infection which may coincide with it.

One word as to prognosis in scarlatina occurring in a woman after labour. Certainly the case here reported is encouraging. Legendre gives twenty-three cases, and sixteen recovered; all of Hervieux's cases, seven, I believe, recovered. If the scarlatina be uncomplicated with septicæmic accidents, and this applies to the great majority of cases, recovery is the rule.

ARTICLE XV.

A CASE IN WHICH FOUR INCHES OF THE ENTIRE DIAMETER OF THE SHAFT OF THE FEMUR WERE LOST BY NECROSIS, WITH COMPLETE RECOVERY.

By JOHN FERGUSON, M.A., M.D., L.R.C.P., Assistant Demonstrator of Anatomy, Toronto School of Medicine, Toronto, Canada.

THE case which I shall briefly mention occurred in a bright healthy boy of nine years. From some unknown cause, according to the mother's story, the lad was seized suddenly with severe pain over the lower and inner part of the tibia. In the course of a few days there was great swelling along the inner aspect of the leg from the knee to the ankle. This was opened and a considerable amount of pus discharged. From this time onward, for a period of nearly four years, abscesses continued to form, and small pieces of bone were discharged, until there were about fifty cicatrices below the knee.

Such, in short, was the history given to me when I saw the patient in October, 1882. When he came under my notice he was tall for his years, pale, and wasted. The wounds on the leg were all healed. He was then suffering very much from pain over the lower and inner part of the thigh, just above the knee. I detected fluid, and made an incision, from which bloody pus escaped. On using the probe, bare bone could be readily detected. The wound remained open, and gradually a large sequestrum became detached. In February, 1883, I removed this, as it had lost all connection with the femur, and was projecting to the extent of two inches from the wound.

On removal the mass was found to be four inches in length, and to embrace the whole diameter of the bone. There were numerous smooth

[1] Les Maladies Puerpérales, 1884.

areas on its surface, indicating the points of separation from the periosteum. The ends were ragged and uneven; and the substance of the bone was very much eroded.

Passing the finger into the cavity in the thigh, a thin shell of newly formed bone could be felt, somewhat like a deep trough. The steps of repair advanced until the femur was once more completely restored. The sequestrum was completely detached, as I have said, in February; and by the early part of June the patient could walk without the aid of a crutch or stick.

The expectant plan of treatment was adopted throughout. Tonics and nutritious diet were ordered. The leg was put up in a secure casing of light perforated gutta percha, so that out-of-door exercise might be indulged in safely. No attempt whatever was made to loosen the diseased piece of bone, as I feared fracture of the femur. Incisions were made in the soft tissues, from time to time, as indicated, to favour the discharge of pus and the escape of the bone. The wound throughout was well washed twice daily with one per cent. solution of phenol.

The diseased mass of bone seemed to come from the diaphysis, just above the junction with the epiphysis. The knee is in good condition, the limb is strong, and there is no shortening.

ARTICLE XVI.

ON MUSCULAR HYPERTROPHY OF THE STOMACH.

By ALEX. MARCY, JR., M.D., and J. P. CROZIER GRIFFITH, M.D., of Philadelphia, Pa.

THIS condition of the stomach appears to be one not generally mentioned by writers on diseases of this organ, and concerning which but little is known. It is in fact a very rare condition. It is true that, accompanying all chronic inflammatory affections of the stomach, such as tumours, ulcers, chronic gastritis, etc., we do have an hypertrophy of the muscular tissue, which is not confined to the muscular element alone, but is accompanied by similar changes in the other tunics, particularly the submucous connective tissue.

Such an overgrowth is generally local, confined to that part of the stomach wall affected, and is the result of the increased nutrition, produced by the greater amount of blood in the part. We also see an hypertrophy, or rather an increase in the size, but rarely in the number of the muscular fibres due to an obstructed pylorus; such increase being entirely compensatory, and analogous to that increased development of all muscular tissue due to exercise of the part, *e. g.*, the blacksmith's arm or that hypertrophy of the heart as seen in diseases of its valves.

An abnormal condition of the stomach often confounded with muscular hypertrophy is cirrhosis (Wilson Fox), plastic sinitis (Brinton), or fibroid induration (Handfield Jones), as it is variously called.

In this disease the walls of the stomach may be increased in thickness in a manifold degree, but such thickening is due to a connective tissue hyperplasia, in the shape of a deposit of newly formed, imperfectly developed fibrous tissue, while the muscular structure may or may not be affected.

The literature bearing upon the subject of this paper is not extensive. A case illustrated by Thierfelder is described as follows:[1]—

The stomach wall was over 3 cm. in thickness. The mucous membrane assumed the appearance of the mammillated stomach, caused by the rapid growth of connective tissue. The fibres of the muscularis mucosæ were penetrated by bundles of newly-formed connective tissue. The submucosa was greatly hypertrophied and rendered very strong and tough by overgrowth of its elements. But almost half of the thickness of the stomach wall was occupied by the excessively hypertrophied muscular coat. This coat was penetrated also by abnormally broad bands of connective tissue reaching from the serous to the submucous layer.

Klebs[2] refers to an overgrowth of the muscular element of the stomach parallel to that growth of other muscles of the body which is found as a result of exercise.

He mentions also local overgrowth as a result of ulcer, cancer, the irritation produced by foreign bodies, etc., which plainly does not refer to a true hypertrophy of the muscular element.

Brinton,[3] in speaking of connective tissue hyperplasia in the walls of the stomach, states that the muscular fibres may be enlarged, but are not increased in number. He also considers this hypertrophy compensatory to the stenosis at the pylorus.

Cornil and Ranvier,[4] under "hypertrophy of the muscular tissue," described the alteration as ordinarily caused by chronic gastritis, accompanying almost every tumour of the organ; such hypertrophy may be limited to the neighbourhood of a cancerous mass, or it may extend more or less throughout the entire muscular tunic.

In a few observed cases, a considerable hypertrophy of the muscles of the stomach, accompanied by narrowing of the pylorus, has been the cause of death.

It would seem that there has not yet been described a true muscular hypertrophy, one in which the change has not been participated in to a certain extent by the other coats of the stomach. And from what we know of the relations of one coat to the other, and of their blood and nerve supply, we unhesitatingly say that it would be impossible for the one coat to be affected unless to some degree it affects its contiguous member.

[1] Atlas der Patholog. Histol. Tafel x. fig. 1, 1876.
[2] Patholog. Anatom., p. 198, 1868.
[3] Dis. of Stom., p. 270, 1844.
[4] American edition by Shakespeare and Simes, p. 418, 1880.

The following case illustrates more clearly than any that have yet been mentioned what is perhaps the nearest approach to a true muscular hypertrophy.

CASE.—William G., American, æt. 46, came under our care Sept. 15, 1881. His condition was rather a peculiar one.

He was greatly emaciated, extremely jaundiced, and very weak.

There was total anorexia, and it was impossible for him to take over two tablespoonfuls of any fluid at one time. Had constant diarrhœa, stools of a light clay-colour, not offensive. Tongue enlarged, smooth, and bright red. He suffered no pain. There was no elevation of temperature. Heart and lungs were normal. Liver slightly enlarged, but no tenderness over it, or enlargement of the gall-bladder. Stomach appeared somewhat contracted, and slightly dull on percussion; no tumour could be detected. He was supposed to be suffering from jaundice from suppression of the secretion of bile.

The third day after coming under observation, he was taken with a chill, which was followed by fever, complained of pain in side, had slight cough, difficult and rapid breathing, and in a few hours died.

His previous history, as afterwards obtained from the physician who had attended him at intervals, was as follows: At the age of eighteen years he enlisted in the army, and while there suffered from chronic diarrhœa. For years afterwards he was a free drinker. During the last five years of his life he had had at intervals attacks of vomiting, frequently accompanied by diarrhœa and jaundice. The ejected matter was either greenish or white, and the stools were usually copious, green, and fluid.

At the *autopsy* all the organs appeared to be healthy, except the lungs and the stomach and duodenum. The left lung was in the first stage of pneumonia, and this disease had probably been the immediate cause of death. The condition of the stomach was exceedingly interesting. It had undergone remarkable contraction, measuring in length only 12.5 cm. and in diameter but 3.75 cm. at the pyloric, and 4.35 cm. at the cardiac extremity. The lumen was greatly diminished, and the organ could not have held over 60 cl. of fluid. The little finger pushed into the interior encountered a stenosis at about the centre of the organ, which it could scarcely pass.

On opening the stomach it was seen that this was produced by a narrow fibrous band, on either side of which was a stellate cicatrix. At the pyloric extremity the lumen was almost obliterated, and would scarcely have admitted a goosequill. The mucous membrane was abnormally smooth, and the stomach wall everywhere very much increased in thickness, measuring toward the pylorus 1.5 cm., and at the greater curvature 1 cm. This same thickening and narrowing had extended into the duodenum until it involved also the ductus communis choledochus, which it completely occluded. Beyond this the intestine rapidly assumed its normal dimensions.

Under the microscope the following histological conditions were revealed. The mucous membrane is very little altered, and in thickness is about normal. A slight growth of newly-formed connective tissue is to be found among the glands. In the muscularis mucosæ there has been a great increase in the amount of muscular fibre, which is mingled, however, with many bundles of connective tissue. The increase of thickness in this coat is seven- or eight-fold, due almost entirely to the overgrowth of the muscular element.

The muscular element of the stomach is increased about three times in thickness. Here, too, this increase is due to an hypertrophy of the muscular tissue, although in many places there exists an intimate mingling with it of newly-formed connective tissue. The fibrous tissue dissepimenta are slightly increased in thickness; the serous layer is unaltered. The submucous layer has undergone the most peculiar changes. In this there is found not only an irregular deposit of the same newly-formed imperfectly fibrillated connective tissue, much as found elsewhere in the organ, but also a new growth of smooth muscular fibre.

This fibre is scattered in larger or smaller bundles throughout the submucous layer, in some places exceeding the connective tissue in amount, in others falling short of it. Toward both the muscular wall and the muscularis mucosæ is the greater amount of muscular fibre, indicating perhaps that in its growth it has extended from these two tunics.

The thickness of this tunic is greatly increased, but exactly to what extent cannot be determined, owing to the gradual blending of this with the two contiguous tunics, produced by the deposition of newly-formed muscular fibre in it.

The lumen of the bloodvessels of the submucosa and the thickness of their walls are greater than in the normal stomach.

The changes noted in the case just described were almost entirely changes in the muscular tissue, and in the submucous connective tissue there was a new growth of smooth muscular fibre.

These changes probably had their starting-point in a morbid process set up by ulcers that had previously existed, as shown by the stellate cicatrices which were observed on the mucous surface.

The case is one of pathological rather than clinical interest. There are no symptoms peculiar to the disease, and the treatment can only be palliative.

ARTICLE XVII.

HARE-LIP OPERATION. NEW APPARATUS FOR DRAWING FORWARD THE CHEEK. By WILLIAM S. CHEESMAN, M.D., of Auburn, N. Y.

THE patient, a lad æt. 18, was admitted to the Auburn City Hospital, seeking relief from the deformity depicted in the illustration. Cleft palate existed as well, but he did not wish that to be operated upon.

On April 20, 1884, the following operation was done. After etherization, the projecting tooth was drawn. The lip and ala nasi on the right side were then freed from their connections to the superior maxilla, so as to be easily movable toward the median line. In order to utilize the border of the right half of the upper lip, the lip was transfixed and a flap cut. The rest of the lip and the interior of the ala nasi were then freshened. The left half of the lip and the interior of the columna nasi were then pared, and a strong pin having been passed through the columna and ala nasi, the parts were approximated and the nostril closed.

A second pin was next passed and tied. Silver wire sutures through the fleshy part of the lip, and numerous silk sutures through the approximated border completed the operation. The cheeks were drawn forward, and plaster straps applied, and iodoform was freely dusted into the right nostril and over the lip inside and out.

The patient made a good recovery from the ether, and the next morning was found to be doing well, except that the adhesive strap from cheek to cheek made considerable pressure upon the lip, causing œdema of the approximated border. To relieve the lip of this compression, while yet the cheeks should be held well forwards, the apparatus represented in the cut was devised and applied. It consists of two curved tin bands crossing at right angles, one encircling the forehead horizontally, while the other follows the perpendicular line of the sagittal suture. From their point of intersection in the middle of the forehead springs a rod which curves downward in front of the lip. A tinsmith can make the apparatus in fifteen minutes. It must then be thoroughly padded, and firmly bound to the head by roller bandages.

A piece of adhesive plaster wide at one extremity, which may be slit as into fingers, is then made to take hold of each cheek like a hand; and traction being made, the cheeks are pulled forward and the lip relaxed. The narrower ends of the plaster-strips are then fastened to the curved rod.

This apparatus did its work perfectly. At the end of a week, union being firm throughout the whole extent of the wound, it was removed, and ordinary adhesive straps applied. The result of the operation is a lip without notch or irregularity, and having none of the *drawn* appearance so common after the usual procedure. Much more easily obtained than the "cheek compressor," and obviating as it does the disadvantages of the ordinary adhesive strap, this device is confidently recommended to the notice of the profession. It is of course inapplicable to nursing children, unless they can be fed with a spoon for a brief season.

REVIEWS.

ART. XVIII.—*Mittheilungen aus dem kaiserlichen Gesundheitsamte. Herausgegeben von* DR. STRUCK. Zweiter Band, Berlin, 1884.
Report of the Imperial Health Office. Edited by DR. STRUCK. 13 chromo-lithographic plates and 13 wood-cuts.

SINCE the appointment of Dr. R. Koch as one of the officers of the German Board of Health some five years ago, the laboratory of that institution has turned out scientific work of remarkable value. It is not apparent from any of its publications whether the members of the board have any official duties, but, however that may be, Koch and his co-labourers are at liberty to spend most of their time in original research in the line of etiology and hygiene. The first volume of Mittheilungen appearing in 1881 is a work of permanent value. Its description of accurate and precise methods in the study of micro-organisms, and especially the direction for the cultivation of bacteria on dry soil, render it an indispensable book of reference to the student of that subject. It completed furthermore Koch's researches on the etiology of anthrax, and presented studies on various experimental infectious diseases of animals. Not the least important topics were the researches on disinfection, which, while they informed us of the unreliability of many agents hitherto employed, showed us the trustworthiness of corrosive sublimate, and the relative merits of many other substances for that purpose. It is but faint praise to state that no trials with disinfectants had previously been made with any similar thoroughness. The work of most immediate practical value in that volume was the employment of escaping steam for the disinfection of large parcels, which mode of disinfection was found far more practical and reliable than dry heat.

Since the issue of the first volume Koch has published his famous discovery of the bacillus tuberculosis; Loeffler and Schütz have discovered the bacillus of glanders; Becker has proven osteomyelitis to be due to an invasion of micrococci; and now the activity of the laboratory is illustrated by the rich contents of the second volume of the Mittheilungen.

The work begins with the full account of KOCH'S *Studies on the Etiology of Tuberculosis.* It contains the details of the work more explicitly than the shorter publication in 1882, besides some additional matter. Since the previous account of these researches has reached a popularity which perhaps no other medical work has ever enjoyed, we can review it more hastily on the assumption that much of it is well known. Koch begins with an explicit description of the methods for staining the tubercle-bacilli, stating his preference for the method discovered by Ehrlich subsequently to his own. He emphasizes the fact that, of all known bacteria, none behave towards the aniline colours and the decolorizing acid like the specific tubercle-bacilli, except the bacilli of leprosy. State-

ments to the contrary he attributes to faulty manipulation. The *spores* of mould-fungi and of a variety of bacilli found in the normal intestinal contents also present the same peculiarities. He points out, moreover, that this exceptional behaviour to staining fluids simply facilitates the search for the bacilli, but is nowise necessary to establish their specific nature. After describing the morphology of the bacilli, he studies their distribution in the diseased tissues.

The number of bacilli in the tubercular tissues may vary enormously. Where the tubercular degeneration is either stationary or receding, there are so few as to make their detection difficult, though they can always be found with patience, while, where the disease progresses rapidly, their number is so immense that the entire microscope field may appear blue with a low power, when a blue staining fluid has been used. The fact that there are so few bacilli in old stationary lesions has been misinterpreted by many. Yet, as far as we know, the virus of other infectious diseases disappears from the system, or at least the part involved, when the lesion recedes toward a cure. The bacilli are found mainly in the interior of the epithelioid cells constituting the tubercle, and especially in the so-called giant-cells, which are sometimes filled with a wreath of bacilli. But the bacilli do not persist indefinitely, but die and disintegrate, so that in old lesions with caseous degeneration either none are left at all, or only their spores, which do not take up the staining material. The presence of the spores was proved by the infectious properties of the cheesy material. Since the bacilli possess no mobility, their transfer from one spot to another is passive as far as they are concerned. Their transportation in the tissues Koch attributes to the white blood-corpuscles which take up a bacillus and with it continue their migration, until the pernicious influence of the parasite, which they have swallowed, causes their destruction. Thus the invasion spreads from the first tubercular deposit into the vicinity. Moreover, in some rare specimens he found a growth of bacilli perforating into a small vessel, sometimes an artery, sometimes a vein, thus explaining the occurrence of metastatic deposits in distant parts by their transportation in the blood current. The one point particularly emphasized by Koch is that wherever the incipient stage of the tubercular process can be studied, there *the bacillary invasion of the healthy tissues invariably precedes the tubercular infiltration.*

The thoroughness of Koch's work is made evident by his summary of pathological specimens examined, viz., the lungs of 29 cases of phthisis, the different organs in 19 instances of miliary tuberculosis, 13 various isolated tubercular processes in kidneys, testicles, etc., 13 tubercular joints, 21 scrofulous glands, and 7 cases of lupus. In all but the latter two classes bacilli were found with invariable constancy, though not in every slide in the more chronic lesions. In the scrofulous glands they were met with as long as the tubercular structure was still distinct, their number being however quite small. Where complete caseous degeneration had occurred, or where the glands had broken down into abscesses, the bacilli could no longer be detected. In four cases of lupus, excised bits of skin showed the bacilli in very limited number in the interior of giant cells; in three other instances only the material scraped off with the curette was to be had, and could not be examined satisfactorily, but its tubercular nature was proven by the positive result on inoculating rabbits in the anterior chamber of the eye. In some seventy instances observations were made on the spontaneous tuberculosis of horses, cattle,

sheep, goats, pigs, chickens, monkeys, rabbits, and guinea-pigs. It was thereby learned that the appearance of natural tubercular lesions is quite peculiar to each species, but in all instances the bacilli were found. It is almost needless to add that in extensive examinations of healthy and morbid, but non-tubercular tissues, these bacilli were never met with.

The industry and perseverance displayed in these studies are almost without parallel in the annals of pathological work. If we take into account that Koch states only what he has actually seen, and not what he might conceive, abstaining altogether from theoretical speculations, it seems fair to demand at least some equivalent work of the few who venture to attack Koch before we listen to their speculations.

In order to complete the proof of the role of the bacillus as the cause of tuberculosis, some 500 animals of different species were inoculated with the specific bacilli. In every instance of the disease thus produced the characteristic bacilli reappeared in the lesions. In a small number of the animals the tubercular products of man or animals were used as such, but in most instances a pure culture of the bacilli was employed. In order to put the validity of his results in the proper light, Koch points out that, on account of the ventilation and cleanliness in the care of the animals, spontaneous tuberculosis appeared but very rarely in his stables, and then only in animals which had been confined there for many months. Furthermore the spontaneous tuberculosis can be distinguished readily from the results of inoculation by the greater dissemination of small tubercles in the latter case, and the localized spread of the disease from the point of infection. During the time of these experiments, several hundred other animals, serving other purposes, were inoculated with other bacteria or non-tubercular disease-products *without contracting tuberculosis in a single instance.*

The cultivation of the bacilli succeeded satisfactorily only on the surface of solidified blood serum. They form a dry scum consisting only of bacilli, which do not penetrate into the soil. When thus isolated they do not differ in appearance or behaviour to staining fluids from the parasites in the living body. Their growth is very slow, and requires a warmth between 29° and 42° C. On account of this sensibility to temperature, their fastidiousness as to the composition of the soil, and their slow growth, which permits other bacteria to crowd them out of existence in any but pure cultures, the important conclusion of Koch seems fully justified, *that the bacilli of tuberculosis are limited to a parasitic mode of life in animals, and cannot grow outside of the body under the conditions found in nature.*

The isolated bacilli, suspended in sterilized water or serum, were injected partly under the skin, partly into the peritoneal cavity, and in other instances into the anterior chamber of the eye. In every experiment on rabbits, guinea-pigs, cats, chickens, pigeons, and field-mice, the tubercular process began in the inoculated spot, and spread thence to the adjoining lymph-glands, culminating finally in generalized miliary tuberculosis. The acuteness of the process depended pretty directly on the quantity of bacilli employed. The bacilli neither lost nor changed their pathogenic properties by growing on the artificial soil for months, and in some instances over a year. Nor could any differences be detected in the results, were the bacilli derived in the first place from typical cases of human or animal tuberculosis or phthisis, from fungous joints, from scrofulous glands, or from lupus of the skin. The inevitable conclusion is, therefore, *that all these morbid processes are due to the same virus, the*

character of the pathological lesion depending on the number and localization of the bacilli and on the power of resistance of the tissues of the patient. This power of resistance, or, as we might term its reciprocal, "the predisposition," is evidently not the same in all individuals, and not in all species. Rats and common mice are not very susceptible to tuberculosis. In several experiments, inoculation with small quantities of material proved harmless to them, although a more energetic infection succeeded invariably. Dogs resist the tubercular virus within certain limits. One animal infected in the abdominal cavity presented during several weeks evidence of decided sickness, the symptoms being the same as in other dogs undoubtedly tubercular. This one, however, recovered fully, the only instance of recovery in Koch's experience. Five months later, a second infection with tubercle-bacilli succeeded again, and produced a fatal generalized tuberculosis. No immunity was granted by the first attack, an observation fully in accord with clinical experience.

Some of the most interesting experiments were made with a spray of water containing bacilli in suspension. In a large box placed in the garden, rabbits, guinea-pigs, rats, and mice were made to inhale this infectious spray for half an hour on three consecutive days. Every one of these animals presented at the post mortem tubercular disease of the lungs, with a deposit of tubercles in other organs proportionate in extent to the lapse of time between the infection and its death. The tubercular nature of the nodules in the lungs was proven by their structure, the presence of bacilli in them, and their infectious properties on inoculating other animals with them. The symptoms during the life of the animals corresponded to the extent of the lesions.

The information that can be derived from these researches as regards the origin of tuberculosis in man Koch sums up as follows: The sputum of every phthisical patient contains at most times, if not always, the characteristic bacilli. The sputum, as experiments prove, is infectious, and retains its disease-producing properties even on drying for many days, and, if spores be present, which is true very often, for several months. During expectoration, and while the sputum remains moist, there is very little opportunity for the bacilli to get into the air to form part of the floating dust. Hence there is no reason why we should expect the presence of consumptives to endanger others by direct contagion. But the sputum dried on the floor or on the handkerchief is converted into dust by the friction and mechanical violence to which it is always subjected. Bacilli thus suspended in the air can cause pulmonary tuberculosis, as proven by experiments. Spontaneous tuberculosis begins, in the majority of cases, in the lungs, while all experiments show that the process always starts from the point of infection. Consumption being so prevalent as it is, we are therefore exposed to the virus in all ordinary localities, and it is a question simply, whether in a given case the inhaled bacilli can get a foothold. Since their growth is very slow, their chance of entering through the intact surface of the lungs is small, if the motion of the ciliated epithelium is active, and if there is no accumulation of mucus. It is evident how previous diseases, like measles, which deprive the mucous membrane of its protecting epithelium, or conditions like adhesions of the pleura or diminished thoracic mobility, which may lead to stagnation of bronchial fluids, can favour the first invasion of the lungs by the bacilli. The progress of the disease then depends on the number of bacilli which have entered and on the reaction of the tissues. If leu-

cocytes take up the bacilli to any extent, and transport them for short distances in the tissues, or carry them into the lymphatic glands, the surface of contact of the body with the virus is thus enlarged, and the spread of the parasites facilitated. If, on the other hand, the spot where they have settled gets surrounded with a barrier of granulation tissue, the further invasion is for the time being checked. How to explain the predisposition in one case, the power of struggling victoriously with the parasites in another, is not yet possible on any direct evidence. The infection of distant localities in the body occurs in various ways. If the sputum from one part is aspirated into another bronchial tube during the effort at expectoration, the disease may be started in a fresh lobule of the lung. If the bacilli-vegetation extends through the wall of a bloodvessel, a sudden infection of distant organs is the evident result, while a more chronic auto-infection may occur by the transport of leucocytes, each laden with a bacillus, along the currents of the lymph-vessels. Finally the consumptive who swallows his own sputum exposes himself to secondary tuberculosis of the intestines, a complication by no means rare, although the sputum does in many cases pass through the canal without infection.

Primary tuberculosis of the intestinal canal, while very uncommon, may be produced by eating tubercular material containing spores. Since, in the case of cattle with pearl disease, the nodules are pretty sure to be removed by the butcher, the danger of eating their meat—the non-infected muscles—may not be great. The milk would likewise not be infectious, except when the tubercular process invades the mammary gland, which is not common. There seems to be some danger also from pork, as Koch found not rarely the occurrence of tubercular glands in hogs.

In the case of fungous disease of the ends of bones, the tubercular nature is established by all the criteria that can be applied. The bacilli can reach these spots only by means of the blood-current. Their point of origin is, however, a matter of speculation, though analogy points strongly to tubercular bronchial glands as the source of such infection. In the minute infected spot in the lungs and in the involved gland, the disease may be at a standstill in such cases.

Tubercular infection of superficial wounds or post-mortem scratches is not likely, if at all possible, in man. Even in the most susceptible animals, the slowly-growing bacilli are eliminated, unless they are put into a protected locality. The differences between the clinical course of lupus and of other tubercular affections Koch does not try to explain. The tubercular nature of lupus, however, as far as the etiology is concerned, he maintains on the strength of the presence of the bacilli and of the infectious properties.

The most critical perusal of Koch's paper leaves no impression but that of unqualified admiration. The language is so plain, the logic so perfect, the interpretation of everything seems so self-evident, that no flaw can be detected. There is nothing smoothed over, and where a gap exists in our knowledge, it is openly shown. The amount of work done seems almost superfluous in view of the harmony of the results. But, as the result of the work, tuberculosis can now rank with anthrax as the most perfect instance up to date of etiological knowledge. It is fair to predict that amongst future assailants of Koch's work there will be very few men of judgment who have read the work in the original.

The second essay in the volume is a statistical research by A. Wuerzburg, the librarian of the health office, *On the Influence of Age and Sex*

upon the Prevalence of Pulmonary Tuberculosis. He based his calculations on the very accurate census reports of Prussia, an immense material, comparing also the statistics of other States. He arrived at results somewhat at variance with former opinions on account of calculating in a manner different from the usual computations. With able arguments he points out that the most correct results can only be obtained by *comparing the death-rate with the number of living persons of the same age*, provided a correct basis is to be had. By means of this calculation, it turns out that, contrary to the usual view, the earlier period of adult life is not the most prone to consumption, but that the danger from this disease increases with the advance of years, also that the mortality during infancy is considerable. An extract from his largest table shows these striking figures:—

Of 10,000 individuals	aged 0–1	year	there die	annually of consumption	$23\frac{43}{100}$.
" "	1–2	years	"	"	$20\frac{41}{100}$.
" "	5–10	"	"	"	$4\frac{66}{100}$.
" "	15–20	"	"	"	$18\frac{87}{100}$.
" "	20–25	"	"	"	$30\frac{24}{100}$.
" "	25–30	"	"	"	$36\frac{77}{100}$.
" "	30–40	"	"	"	$41\frac{13}{100}$.
" "	50–60	"	"	"	$67\frac{94}{100}$.
" "	60–70	"	"	"	$93\frac{11}{100}$.
" "	70–80	"	"	"	$61\frac{72}{100}$.
" "	over 80	"	"	"	$25\frac{80}{100}$.

In Prussia males are more prone than females on taking the average of all ages. Similarly the inhabitants of cities show a greater mortality than dwellers in the country. But on tracing separately the mortality of the sexes at different periods of life, in cities and in the country, certain differences are found, which taken in connection with the known habits of the people point pretty strongly to the injurious influence of confinement in insufficiently ventilated rooms.

The succeeding article, by Dr. GAFFKY, refers to *the constancy with which the characteristic tubercle bacilli are found in the sputa of consumptives.* During three months a daily examination of only one slide a piece was made of the sputa of a number of patients under observation in hospital. Of fourteen patients each one was examined at least some twenty times on consecutive days. In twelve of these cases 982 examinations were made with 95.5 per cent. of positive results, while only in 4.5 per cent. the bacilli were not found. It is to be remembered that only one slide was searched at a time. The importance of this result for diagnostic purposes is evident.

Two other cases require special comment. One of these with slight infiltration of both apices of the lungs showed no bacilli the first seven times, subsequently they were found six times in eight days. After fifty-one subsequent negative examinations he left the hospital very much improved. The second one, with slight consolidation of the left apex, showed some four to six bacilli in each microscopic field the last days of December, a less number on the first two days of January, then none at all during the following three months, with the exception of one day in March. At the end of that month he died of a perforation of the intestines due to swallowing a number of plum kernels. The autopsy revealed

no active tubercular process, but merely a small calcified spot in one lung and slaty induration of both apices. Whether this cure of the disease might have remained permanent is left an open question.

The Disinfection of Tubercular Sputa was studied by Drs. SCHILL and FISCHER by inoculating series of animals with the sputa before and after exposure to the substances employed. At first dried sputum was employed. But it was learned that between the one-hundredth and two-hundredth day its virulence had become uncertain, and the experiments made with it are therefore not stated as conclusive. Subsequently only the fresh, moist sputum was used, although repeated trials proved that putrefaction during fully six weeks did not diminish its virulence. In other observations dried sputum, not over two weeks old and decidedly virulent, was tested for comparative purposes. It was learned that dry heat of 100° C. was not reliable, but that the bacilli and their spores dried on cloth could be destroyed with certainty by exposure to a current of steam at the ordinary boiling-point within a short time. In the case of even large parcels like bedding, to be disinfected, one hour's exposure is amply sufficient. Fresh sputum could be rendered harmless by boiling within five minutes, but for the disinfection of larger quantities the time of half an hour is recommended. Of a large number of chemical disinfectants tested carbolic acid was found the most reliable and economical, but still of this agent a five per cent. solution in quantity equal to that of the sputum was found necessary, with twenty-four hours' exposure, in order to get reliable results. Corrosive sublimate is not available in spite of its potent antiseptic action, since it produces a precipitate with sputum which prevents the penetration into the interior of the expectorated masses.

In the next contribution KOCH, GAFFKY, and LOEFFLER state their observations on *the Attenuation of the Bacilli of Anthrax in order to Procure Immunity* against the disease by vaccination. Most of these results were published about one year ago in Koch's reply to Pasteur. While they confirm the scientific importance of Pasteur's researches, they differ from him in many practical details on which the value of the plan depends. The capital discovery of Pasteur that the cultivation of the bacillus anthracis in neutralized chicken-broth at a temperature of 42° to 43° C. lessens gradually its virulence to animals was at once confirmed. But contrary to Pasteur's view the cause of this change was not found in the influence of oxygen, but in the effect of the high temperature, for the rapidity of the attenuation depended directly on the exact degree of heat. Inoculation with such attenuated virus did not confer immunity against severe attacks on rabbits, guinea-pigs, or mice. These animals did not lose their susceptibility to the disease by any number of mild, non-fatal infections. But sheep could, indeed, be rendered less susceptible by preventive vaccinations, not, however, with the certainty or infallibility that Pasteur claims. In his various communications Pasteur does not state what tests he applies to his vaccinal matter in order to gauge its virulence. By tedious trials the German investigators filled this gap. They found that the first inoculation of sheep was both safe and yet effectual, if the virus could still produce fatal anthrax in mice, but not in guinea-pigs, which corresponded to some fifteen days' cultivation at the high temperature. The second vaccine virus must be of a strength to kill guinea-pigs, but spare rabbits. The two forms of virus put into the market under Pasteur's directions do, indeed, possess this relative virulence. Not satisfied with two vaccinations Koch and his assistants inocu-

lated some of their sheep four times with bacilli of increasing virulence, and still the immunity was not absolute in every case, when tested by inoculation with blood of an animal dead of the intense form of the disease; for some of the sheep thus protected still succumbed. Pasteur's brilliant public demonstrations of the efficacy of his protective vaccinations can be only explained by assuming that he tested the resistance of his animals with a virus less virulent than that employed by the German investigators.

The practical value of protective inoculation hinges on the question, whether the natural mode of infection is any more, or whether it is less dangerous to the vaccinated animal than the artificial inoculation under the skin. Pasteur speaks of the natural infections as less dangerous, but without giving any proofs. It was therefore attempted to imitate the natural mode of infection by feeding the animals with the virus. If bacilli without spores be used for this purpose, they are destroyed by the acid in the stomach, and hence prove harmless. But the spores, when hidden in potatoes which were pushed into the animal's throat, passed the stomach uninjured, and could then germinate in the contents of the intestines. The result of such feeding experiments on sheep varied with the amount of spores employed. Pills of spores of the size of a pea killed the animals invariably within one to two days, while small traces of spores produced the disease only after an incubation of six to eight days, as is usual in anthrax occurring naturally. Moreover, when very few spores or very old spores were fed not every animal succumbed, evidently because in such a case the spores may leave the intestines with the feces before the growing bacilli have time to enter the intestinal wall. The autopsy showed that the bacilli resulting from the germination of the spores gain entrance into the system through the mucous membrane of the small intestine, and especially through the Peyerian patches, which appear inflamed. These are also the lesions in the natural form of the disease; hence feeding with spores ought to be the test of the immunity produced by vaccination.

Five sheep vaccinated with Pasteur's virus, and five others vaccinated with virus mitigated in the Berlin laboratory, had been inoculated with virulent anthrax material under the skin, and had survived. These ten animals, which should now enjoy the most perfect immunity, were fed with large quantities of spores with the result of two deaths, while the other eight had actually acquired an absolute immunity. This immunity persisted on repeated trial nine months later.

Since a vaccination sufficient to protect the animals against experimental anthrax-infection produces a certain loss by itself by killing a small percentage, since the natural mode of infection is even more dangerous than experimental inoculation, and since the second vaccine virus must necessarily be so virulent as not to be harmless to other animals or man, Koch and his assistants claim that Pasteur's vaccination is at present of doubtful practical value.

It is doubtful whether this severe judgment is wholly unbiased. Admitting the truth of his premises, it must still be remembered that the number of spores which an animal is likely to swallow naturally is very small compared with Koch's enormous doses. After all it is less important, practically, whether the immunity is absolute, than that it should be sufficient to leave the farmer a balance of cash in his favour on comparing the costs of vaccination and the slight loss produced thereby with the loss

which his experience has taught him to figure on annually in unprotected animals. Even vaccination with cowpox is not an absolute guarantee against smallpox. The large statistics of Pasteur have certainly shown that, as a matter of national economy, the protective vaccination against anthrax is more of a success than would appear from the severe censure of it by the German board of health.

Dr. Hesse contributes, in the next place, a paper on the *Quantitative Determination of the Micro-Organisms in the Air.* He points out that it is of no service to be able to demonstrate more or less germs caught on a slide, for the point of importance to know is, whether these germs are still capable of growth, or whether they are dead. If the germs in the air are caught, on the other hand, by passing the air through nutrient solutions, it is impossible either to recognize what varieties existed in the air, or even how many of the germs there are, for the most actively growing variety will soon fill the solution, crowding out the less vigorous species. But by the application of Koch's method of culture on solid soil the dust floating in the air can be analyzed quantitatively and qualitatively. For this purpose a glass tube, some 70 centimetres long and 3.5 centimetres wide, is partly filled with a nutrient gelatine, is closed at one end with a rubber cap, and connected at the other hand with a smaller tube plugged with cotton. This apparatus is then sterilized by a current of steam. Where the air is then to be examined an aspirator is attached at the smaller end, and the rubber cap is removed, all this with antiseptic precautions. As the air passes slowly over the gelatine in the horizontal tube all floating particles settle on the layer, but only on the lower horizontal surface of the tube. At the rate of 1 to 4 litres of air drawn through per minute none of the suspended germs reach the cotton plug at the further end, indeed they mostly settle near the open end of the tube. According to the amount of dust in the air a half litre may suffice, or 100 litres may be necessary for quantitative estimation. On keeping the tube warm, but below the melting-point of the gelatine for several days, every deposited germ, if living, will develop into a visible colony of micro-organisms, each colony representing but one species. Their number can then be readily counted, and if desired each colony can be identified by transplantation on a fresh soil, and appropriate tests applied as to its fermentative or pathogenic properties.

The work of developing the method seems to have filled Dr. Hesse's time, so as to leave as yet no time for any extensive application of it or qualitative analysis of the results. It was learned, however, that germs are more frequent in inhabited rooms than in the open air in proportion to the movements of persons in the rooms. Furthermore, that damp weather reduced the number of suspended germs considerably, affecting least the spores of mould fungi. There were fewer germs found in the higher than in the lower strata of the air. In the open air there were sometimes as few as four germs in 20 litres of air, while in a rag-assorting shop every litre of air contained hundreds of living micro-organisms.

On examining air drawn through thick layers of sand or common soil, it was found that all dust had been retained by this filtration, and no germs developed on the gelatine. Similarly it was learned that brick and various building materials were impenetrable to bacteria, even in thin strata. Through very thin layers, however, the spores of mould fungi could penetrate. This seems singular, since these spores are much larger than bacteria. Microscopic examination of the colonies furnished the

interesting explanation, that mould-spores float in the air by themselves, while bacteria always adhere to the surface of larger, though still microscopic, motes.

In the following essay Prof. SCHUETZ studies two *Mycotic Affections of Birds*. An epidemic amongst geese in a yard near Berlin was found to be essentially a croupous pneumonia. In the lungs and air-sacs of the animals a mould fungus was seen, which, on artificial cultivation, proved to be aspergillus fumigatus. By inhalation of the spores of this fungus healthy birds could be infected, and the typical disease reproduced. It was also learned that aspergillus niger could vegetate in the lungs of living birds, while the more common aspergillus glaucus showed no pathogenic properties.

By similar methods of pure cultivation and inoculation it was shown that the crusts on the cock's comb, known as tinea or favus of poultry, are also a mycotic affection.

Drs. FISCHER and PROSKAUER tested *the Disinfectant Power of Chlorine Gas*. Pure cultures of many pathogenic bacteria, as well as non-pathogenic micro-organisms, both with and without spores, also mould fungi and yeast, were exposed to the fumes in a large glass bottle. The test-objects were partly dry, partly moist; some were directly exposed, others were hidden in packages. The percentage of chlorine gas, as well as the degree of dampness of the air, was varied in different experiments. Accurate record was kept of all the conditions, and successive estimations of the amount of chlorine remaining were made during each experiment; at the end of each experiment all the samples of micro-organisms were planted on a gelatine soil, so as to test their survival, while the virulence of the pathogenic varieties was, moreover, tested by inoculation. The effect of the exposure on each species could thus be rigidly determined. The amount of work represented by the paper must have been enormous, and it is, moreover, of the most painstaking character.

It was learned that the disinfectant effect of chlorine, very slight in dry air, increased with the moisture of the atmosphere. When the air was quite damp, but still far from the point of saturation, one volume per cent. of chlorine killed all micro-organisms and their spores inside of twenty-four hours, and those exposed in thin layers even in three hours.

On testing the practicability of disinfection with chlorine on a large scale in the basement of the building, the results were much less satisfactory. In spite of the utmost care in pasting strips over and plugging all cracks and openings around windows and doors, the percentage of chlorine in the air could not be kept constant, but diminished quite rapidly. Moreover, it was not evenly distributed throughout the rooms, and did not seem to enter nooks and corners sufficiently. It was also found difficult to maintain a sufficient degree of moisture of the air. Hence, the result was that only those test-objects which were exposed in thin layers and in the most favourable parts of the room were thoroughly disinfected, while micro-organisms hidden in packages or placed in spots less accessible to the gas were not destroyed with certainty. Clothes, moreover, were injured by the chlorine to such an extent as to render their disinfection impracticable. Such articles, however, can be well disinfected with escaping steam. Still, the authors consider chlorine as the most efficient agent at present available for the disinfection of such localities as cannot be purified by washing all objects and surfaces with fluid antiseptics, for it can be relied upon, if properly used, to destroy at least all superficially exposed germs, while

their own researches proved bromine inferior in that respect, and those of Wolfhuegel, made three years ago in the same laboratory, showed the unreliability of sulphurous acid. The necessary one per cent. of chlorine gas requires the use of 0.25 kilo chloride of lime, and 0.35 kilo crude muriatic acid per cubic metre space.

The contribution by Dr. HUEPPE, on *the Decomposition of Milk by Micro-Organisms*, is the first systematic application of Koch's methods in the investigation of bacteria causing fermentations. Former observers had either studied the chemical side of the question exclusively, or had used insufficient methods in their examination of the bacteria concerned. The principles involved in Hueppe's work were the use of thoroughly sterilized milk, which was infected, when desired, with pure cultures of bacteria grown on a solid soil of nutrient gelatine. He shows, by a review of the literature, that, in spite of many contradictions, milk drawn from the udder with antiseptic precautions, but *without* the addition of any antiseptic chemicals, will never sour or curdle. The successful experiments of Roberts, Lister, Cheyne, and Meissner show that this is possible, though possible only with some skill and in localities kept more than usually clean. At any rate, the successful experiments prove that souring and curdling of the milk are always due to micro-organisms, which get in after it leaves the gland. Since it is so difficult to gather the milk uncontaminated, it was sterilized by heat. This can be done by as low a temperature as 70° C., but in order to destroy spores, it must be applied an hour at a time for five consecutive days. For during this time any spores present begin to germinate, and thus lose their power of resistance to heat. A temperature of 100° C., obtained by a current of steam, will sterilize the milk absolutely in less than forty-five minutes. But boiling produces slight chemical changes, which must be kept in view. These are precipitation of the serum-albumen, to which a trace of the casein clings mechanically. The boiled casein, moreover, is not curdled quite as readily by the action of rennet, while it is precipitated by acids as well as in the fresh milk. The stomach digestion of milk is therefore somewhat impeded by boiling. Continued boiling also splits up the milk sugar to a slight extent.

The micro-organisms which cause the souring of milk are to be found in every sample of milk obtained in the usual way, in most cases together with other bacteria. By transplantation on a solid soil where no currents or movements of fluid cause the different varieties to intermingle, any one species can be isolated. Although Pasteur, Lister, and others had correctly described the appearance of the lactic acid bacteria, they had incorrectly named them micrococci. High lenses and staining show them to be very short but thick rods; they belong hence to the genus bacillus. Like other bacilli, they produce permanent spores, which, however, readily escape detection in the milk on account of the high refractive index of the milk-serum. On account of these spores, milk is not preserved indefinitely by boiling it for only a short time. These bacilli convert milk-sugar and other sugars in nutrient solutions into lactic acid with the production of some bubbles of carbonic acid. The utmost extent of acidity to which they can give rise is 0.8 per cent., but if the acid be neutralized by the addition of chalk, they will ultimately transform all the sugar present. The curdling of the milk is due only to the acid formed, not to any direct action of the bacilli upon the casein. Their activity is greatest at a temperature between 35° and 42° C.; above 45° C. they are paralyzed. They exert

no fermentative action on other substances as far as the examination went, with the exception of a feeble diastatic effect on starch. The action on sugar is due to the growth of the living bacilli, and could not be traced to any chemical ferment, which they might secrete, as has been supposed by others. The lactic acid bacilli cannot attack sugar in the total absence of oxygen. They require, however, but very little of that gas. Since, within certain limits, their activity increases with the amount of oxygen at their disposal, Hueppe cannot admit the correctness of Pasteur's hypothesis that fermentation is life without oxygen.

In the description of the bacilli which cause butyric acid fermentation, Hueppe agrees with various previous authors. He adds that these bacilli cannot attack sugar, but that they can only convert the lactic acid, previously formed by the other bacteria, into butyric acid. They have the ability to curdle the casein in neutral solution like rennet, and subsequently re-dissolve the coagulum with the formation of pepton and some other albumen derivatives, amongst which are ammonia and some bitter products.

Hueppe's investigation of the bacteria causing the blue colour of milk, when it undergoes that singular fermentation, furnished again a strong argument in favour of Koch's views of the stability of bacterial species. Previous studies of this blue change in milk made some few years ago by Neelsen had apparently shown some striking metamorphoses of the micro-organisms concerned, when they were cultivated in different media. In fact Neelsen's experiments seemed hitherto one of the best supports of the view that bacteria have no absolute constancy of form. Hueppe, however, shows in the most convincing manner that Neelsen committed gross errors in not using sterilized milk and pure cultures of his bacteria. It turns out in this case, as well as in every other sufficiently investigated, that the characteristics of bacterial species are just as definite and constant as in the case of higher plants. The article concludes with some studies of other colour-producing bacteria.

Dr. GAFFKY describes in the next paper his researches on *the Etiology of Typhoid Fever*. From his excellent summary of the literature, it appears that hitherto three different varieties of micro-organisms have been observed in that disease. Von Recklinghausen was the first to detect colonies of *micrococci* in the internal organs of typhoid cadavers. The same have since been seen by others, but their presence is not constant. Later on Klebs described thin bacilli growing out into very long filaments, which he had found in the ulcerated patches of the intestines, and seen in some instances also in internal organs. Others, however, Meyer and especially Koch (in the first volume of the "Mittheilungen"), pointed out that Klebs's bacilli are scarcely ever seen except in the most superficial strata of the necrotic Peyerian patches, in which exposed locality, the presence of bacteria, growing in from the intestinal contents, is to be expected, without indicating any causal relation to the disease. Entirely different bacilli were found by Eberth in the Peyerian patches, mesenteric glands, spleen, and some other organs of typhoid cadavers. They were short rods with rounded ends, arranged in characteristic colonies. Their staining was found rather unsatisfactory, at least with cold solutions. They could be distinguished from bacteria found in other diseases, but they were not present in more than one-half of the cases examined. The more advanced the disease the less likely were they to be found. Independently of Eberth, Koch had made similar obser-

vations and had furnished photographs of these bacteria in the first volume of these reports. Meyer and Friedlander likewise confirmed the results.

Gaffky's own researches were made on the organs of twenty-eight typhoid cadavers with the result of finding the characteristic bacilli colonies of Koch and Eberth in some of the viscera apart from the intestines in twenty-six instances. They seemed most numerous in the spleen, but variable in distribution in the other organs. Occasionally it required a large number of sections before a colony could be found, especially in the later stages of the disease. This explains why they were not found in the viscera of two other cases which had died at a very advanced period. In one of these two instances, there had been a relapse as indicated by fresh ulcerations in the intestines, and in these fresh patches the bacilli could again be detected. Gaffky attributes his success in finding the bacteria with such regularity to his staining methods, using concentrated solution, especially methyl-blue, and exposing the sections for a long time or warming them. He admits that the typhoid bacilli do not stain as deeply as other bacteria. They frequently contained spores. Micrococci-colonies were found but in a single case. The bacilli of Klebs were seen quite often, but only in the ulcerated patches, and extending thence into the bloodvessels. They were never seen in Peyerian patches or follicles not yet opened by ulceration. Hence Gaffky considers the invasion by either micrococci or Klebs's bacilli as secondary, though by no means harmless processes. They probably represent complications.

The typhoid bacilli were cultivated outside of the body without much difficulty. The spleen or some other organ was taken from the cadaver as soon as possible, washed externally with a solution of corrosive sublimate, sliced successively in different directions with knives previously heated, whereupon a needle previously heated was drawn across the surface and then used for inoculating gelatine. The gelatine was rendered nutrient by the addition of meat extract and pepton. The bacilli grew on this soil in the form of rounded colonies of a brownish tinge, without liquefying the gelatine. Transferred to the surface of a boiled potato slice, they formed a thin scum, not visible to the naked eye, which extended very rapidly over the surface. This mode of growth on potatoes was found very characteristic of the typhoid bacilli. They could also be cultivated in fluid blood serum or meat-broth, and less vigorously, it is true, in the decoction of various vegetables. These observations show that the typhoid bacilli are *not* limited to a parasitic mode of life in the bodies of human patients. The bacilli examined in a drop of fluid showed decided mobility swimming rapidly towards the edge of the drop, where they collected in groups. When cultivated at a temperature between 30° to 42° C. the bacilli formed spores, usually one at the end of each rod. With the pure cultures of these bacilli experiments were made on numerous animals of different species, including some monkeys. But it was not possible to produce typhoid fever in any animal by feeding or injection, or by any other mode of inoculation. In fact, no animal is known to take the disease spontaneously, and there is hence no immediate prospect of verifying the pathogenic properties of these bacteria by experiments on animals. But since these bacilli are invariably found in the diseased intestines and the internal organs during the progressive stage of typhoid fever, and since they have never been found in any other disease, Gaffky

considers their causal relation to the disease as extremely probable, if not absolutely proven.

In the next place, Gaffky details his investigation of an epidemic of typhoid fever occurring in a body of soldiers stationed in Wittenberg. The essay is a beautiful model of what might be called "scientific detective skill." All chances of infection through the air, soil, food, and so on are carefully considered, but finally discarded on the strength of the evidence, which pointed in an unmistakable way to a well as the source of the epidemic. It was shown that this well could have been infected from an adjoining privy, for a communication between the two occurred through the intervening soil. In that privy the feces of a few typhoid cases had been emptied some months previously. The large demand for water from that well on account of the hot season and the sinking surface water evidently favored the transportation of the germs. The crucial test, however, the search for the bacilli in the well water by means of cultures on gelatine failed completely. The bacilli could not be found. Still this negative result was to be expected, for the majority of infections had occurred before Gaffky's arrival. Even if the period of incubation be assumed as short as two weeks, the water had lost its infectious properties before the search was begun, as could be traced by the date of the infections.

The last article of the volume is by DR. LŒFFLER, *On the Significance of Micro-Organisms in Diphtheria of the Human Race, of the Pigeon, and of the Calf.* A critical review of the literature shows that, up to the present time, scarcely anything is known with certainty as to the relation of specific micro-organisms to diphtheria. All observers have found bacteria in the membranes, but since the membranes are exposed to the air and to the fluids of the mouth, teeming with bacteria, this result must be expected, and proves nothing. As regards the kind of bacteria the statements vary; micrococci seem to have been most commonly found. The most positive observations are those of Klebs, communicated at the last congress of German physicians at Wiesbaden. With the use of staining methods he invariably found delicate rods in the deeper layers of the pseudo-membranes. The different cultivations of diphtherial virus hitherto attempted cannot inspire one with any confidence. Even the transmission of the disease to animals by means of the pseudo-membranes has not been successful in many instances. In internal organs bacteria have been found so rarely, that they must be regarded a complication in diphtheria.

Lœffler searched for bacteria in the pseudo-membranes and diseased mucous membranes, sometimes also in the viscera of twenty-seven cases of either pure diphtheria or scarlatinal diphtheria. Quite a variety of different micro-organisms were found, but mostly in such an arrangement that their invasion could not be considered as anything but a secondary affair. Two varieties, however, were met with some constancy, though not found in every case. One of these was a small micrococcus in chains, which penetrated usually through the pseudo-membranes into the mucous membrane. It was also found to some extent in internal organs. Pure cultures of it injected under the skin of animals produced some transient inflammation of not much consequence except in rabbits. In these animals a typical erysipelas was obtained by inoculation with these cocci, while their injection into the bloodvessels produced suppurative inflammation of joints. Since they cannot be distinguished from the

micrococci of erysipelas by their mode of growth or their effects upon animals, Lœffler considers them either identical with or closely allied to the virus of erysipelas. Since they produced no result in animals comparable to human diphtheria or to the effect of inoculation with pseudo-membranes, they cannot be the cause of diphtheria. In Lœffler's opinion, they are the cause of a common complication in diphtheria, which complication might be considered as an erysipelas of the mucous membrane. The same parasites, giving rise, as far as can be judged, to similar complications, are found also as secondary invaders in other lesions of mucous membranes; for instance, in smallpox and typhoid fever. These rather startling statements may seem bold to clinicists, but cannot be disproved on clinical evidence alone. The position of the clinicist seems to the reviewer like that of a geologist who learns that in one of his specimens, well known to him by appearance, some new element has been detected by a competent chemist. Without a competent repetition of the chemical analysis, he would have no right to dispute the chemist's assertion.

The second variety of micro-organisms found with any regularity in pseudo-membranes were the delicate rods described by Klebs. From the position in which they were detected, it would seem most logical to accuse them as the cause of the disease, for they were found only in the deeper layers of the pseudo-membrane, but not extending into the lining membrane. They occurred, moreover, in the more typical cases of genuine diphtheria. But they are not met with in every instance. Lœffler suggests that they can be eliminated at an early period of the disease, as soon as the lesion ceases to be progressive, but he does not conceal the hypothetical character of this explanation. These rods occurred sometimes in the lungs when they were inflamed as a complication, but not often in other organs.

The bacilli were cultivated outside of the body. The only satisfactory soil on which they grew well was solidified blood-serum, with the addition of meat-broth, pepton, and grape-sugar. The growth required a temperature over 20 C°. They formed no spores, and their duration of life was limited to some three months.

Inoculation with the pure culture of these bacilli proved harmless to some species, but gave decided results in rabbits, guinea-pigs, and birds. Introduced under the skin, the parasites caused an intense inflammation, resulting in a fibrinous exudation. On intact mucous membranes they could not get a foothold, except in the vulva of guinea-pigs; but on inoculating them into the conjunctiva, or pharynx, or trachea, a typical growing pseudo-membrane was produced, with general involvement of the animal's health, usually terminating fatally. The disease was more readily produced in young than in older animals. The conclusion seemed inevitable that the bacilli produce some irritant poison, by the secretion of which the extensive local action and constitutional effect could be explained, for they were out of proportion to the limited number of bacilli actually found. Lœffler himself admits that his experiments do not prove in an unequivocal manner the causal relation of these bacilli to diphtheria, but considers that point at least as very probable. He sums up the arguments *pro* and *contra* as follows: (1) The bacilli were not found in every typical case of diphtheria, but they may have been eliminated, for such elimination occurs also in other bacterial diseases. (2) Their arrangement in the pseudo-membranes of rabbits and chickens was not as typical as in human diphtheria. (3) Mere application to the intact

mucous membrane of susceptible animals did not produce infection, but we are not sure but that a preliminary minute lesion of the membrane is also necessary in man. Moreover, these animals have no organ like the human tonsil, with recesses and niches, where the parasites can start their vegetation. (4) None of the surviving animals ever presented any paralytic symptoms; but post-diphtheritic paralysis is also rare in man. (5) On examining, by means of cultures, the buccal mucus of twenty healthy children, the characteristic bacilli were found in one instance without diphtheria. But the presumption is not unreasonable that during the time of an epidemic a specific germ may reach the mouth of a child, and vegetate in the fluids, without gaining entrance into the mucous membrane, and causing the disease.

The article concludes with some observations on epidemics of a diphtheria-like affection in birds and in calves, due, however, to bacteria different from those of the disease in man.

Of the volume as a whole it can only be said that all its contributions are characterized by a thorough familiarity with the work done by others, a severe and generally unbiased criticism of the same, not any more sparing, however, with reference to the work done by the authors themselves, a remarkable amount of patient and well-directed work, guided by decisive logic, and, finally, a most cautious interpretation of results.

Those who are pleased to speak of the defenders of the germ-theory as theorists might be perplexed to point out many volumes each written page of which represents so much painstaking work as in these Mittheilungen. The plates, illustrating Koch's tubercle-bacilli and Hesse's analyses of the floating-matter in the air, come up to the general excellence of the volume. H. G.

ART. XIX.—*Traité Clinique de l'Inversion Uterine.* Par P. DENUCÉ, Doyen et Professeur de Clinique Chirurgicale à la Faculté de Médecine de Bordeaux; Membre correspondant de l'Académie de Médecine et de la Société de Chirurgie de Paris, etc. etc. Avec 103 figures intercalées dans le texte. Paris, 1883, pp. 644.

A Clinical Treatise on Inversion of the Uterus. By P. DENUCÉ, Dean and Professor of Clinical Surgery, etc. etc.

THE impulse which led to the production of this book is graphically set forth in the preface. A young woman appeared at the author's clinic who suffered from metrorrhagia, and had in the vagina a pediculated tumour of the size of a small pear. She had been sent by a medical man in whose judgment the author had confidence with a diagnosis of polypus. For many years she had resided in the same family, and bore a good reputation; not only was there nothing to cause the slightest suspicion, but she denied positively ever having been pregnant. The tumour was removed by the écraseur, not without, however, causing severe pain, which awakened doubts and fears. The doubts were confirmed and the fears realized; the patient died within forty-eight hours.

This condition could not, then, be sufficiently known or its symptoms analyzed, and the author set about an exhaustive study of the subject. He found that he was in good company! The same error had been com-

mitted by some of the foremost surgeons of the world, by such men as William Hunter, Petit, Denman, Clarke, Paletta, Bloxam, Johnson, Jobert de Lambelle, Velpeau, Oldham, Le Fort, Gosselin, Lombe Atthill, and Barnes. He found also some historical points of interest. In France the subject of inversion of the uterus remained untouched during the first half of the present century; it has been absolutely neglected since Baudelocque. During this period, however, he found, to his great surprise, that the British school had been studying the subject and had completed it; that "while we had left it almost in darkness, Hunter, Denman, Clarke, Newnham, Windsor, Davies, Gooch, Crosse, Johnson, MacClintock had thrown upon it the most brilliant light." It would not do, however, to be too generous; it might seem unpatriotic; all the facts discovered and heralded by the British school from 1800 to 1850 are claimed to be found "in germ" in the facts discovered and proclaimed by the French school of the seventeenth and eighteenth centuries!

We suppose that we must accept our share of, and learn wisdom from, the author's sweeping charge against all other schools than the French that they have a deplorable habit of neglecting historical research and of taking account only of the practical facts they have studied and presented. "Scientific language gains thereby a certain precision; but from that to entire forgetfulness of what has been before accomplished there is but a single step."

Farther into the history of the subject it is not necessary to follow the author. In the first part of the book, occupying about one hundred pages, it is traced from the ancients downwards, and in a manner worthy of a scholar having at command the complete libraries of the French capital.

The consideration of the conditions under which inversion of the uterus may take place opens the clinical portion of the work. They are, a distension of the organ and thinning of its walls by the gradual development of something contained in it, and the sudden evacuation of its contents. Practically but two circumstances fulfil these conditions, pregnancy and the growth of a polypus, thus making two great divisions of the subject, puerperal and polypoid. To the former our attention will be almost exclusively directed. In regard to their relative frequency Crosse[1] says that of 400 cases, 350 will be puerperal. Of 100 cases collected by the author 88 were puerperal, 11 polypoid, and 1 from cancer. Meantime an examination is entered into by the author as to whether the accident can ever follow distension of the uterus by blood, as in occlusion of the passages, or by a collection of water, hydrometra. The statement is made that there is no such case recorded in the annals of science. Not so as to hydatids, a disease which may furnish all of the prescribed conditions; the case of Thatcher, the only one on record, is given, quoted from Crosse's essay, a source from which every subsequent writer upon the subject has drawn.

The etiology and mechanism of uterine inversion present some points of deep interest and of great practical importance. Connected with these subjects we find in the past first, adhesion to partial views with entire blindness to others, and finally slow recognition of the truth which covers and explains all. Nor can the present claim immunity from reproach; there is not yet entire accord of opinion, nor has the truth yet permeated the profession so generally as is desirable. Unfortunate, in more senses

[1] Trans. of Provincial Med. and Surg. Association, London, 1844, 1847.

than one, is the practitioner in whose hands inversion of the uterus takes place. So firmly rooted in the profession is still the doctrine that pulling at the cord is the cause of the accident, that he is sure to be blamed, however innocent, and so clear does it appear to the laity that there was undue interference that reputation is most unjustly ruined. We feel compelled then to criticize the author upon these branches of the subject, but can only generalize as to his treatment of them. He does not make prominent enough the great truth now recognized by all writers on the subject, that inversion may take place in various ways and especially without any initial impulse having been given by the accoucheur. He recognizes as causes: I. Tractions upon the internal face of the uterus; II. Pressure upon its external surface; III. Uterine contraction *per se*. While recognizing the first as an efficient cause, which it certainly frequently is, he gives undue prominence to the second at the expense of the third. For instance, he utterly ignores, passing without mention, the influence of the present current mode of delivering the placenta, Credé's method, which has certainly not infrequently caused the disaster. The author's classification is not so good as that of Duncan,[1] whose essay he does not seem to have met with. That writer recognizes a passive inversion, spontaneous and artificial, and an active inversion with the same subdivisions. Further, we regret to say that the author may be the means of perpetuating the injustice. Thus, adherent placenta and its artificial delivery are well-recognized causes of inversion. Of 148 cases given in Lee's[2] masterly essay, which also seems to have escaped the author's observation, in 67 the placenta was adherent, and in 53 it required manual delivery.

"If this operation is well performed, it does not ordinarily cause inversion because one hand sustains the uterus while the other peels off the placenta. But when the operation *is done by unskilful hands*, or when the after-birth is absolutely adherent, the uterus may follow the tractions and inversion be produced."

In other words, the occurrence of inversion is proof that there was want of skill in the operation.

In regard to the mechanism, the initial and successive steps, by which the process is accomplished, the author is also, in our opinion, partial. His view is too rigidly fixed on the depression of the fundus. The theory of Klob, which has in Dr. Isaac E. Taylor, of this country, a warm and able advocate, receives but scant notice. It is disposed of in a note of about a dozen lines, a consideration which we feel very sure is far from what its merits deserve.

It is interesting to find in this section that the doctrine in regard to the seat of the placenta being thinner, weaker, and more easily depressed than any other part of the uterus—thus forming a "partial inertia" which is often the initial step of invasion—was taught long before Rokitansky, whose name is everywhere given as the first promulgator of these facts. It was taught in the clearest manner as early as 1776 by Leroux, who has long been forgotten, while Rokitansky has had the credit. The site of the placenta being generally in the neighbourhood of one of the tubes from which the ovum escapes, the theory of Kiwisch and of Oldham, according to which inversion begins at one of the cornua of the uterus, seems to the author to deserve acceptance.

[1] Researches in Obstetrics, New York, 1868.
[2] Amer. Journ. Med. Sci., October, 1860.

The author's position in regard to inversion produced by the active contractile force of the uterus itself is something very singular in view of the facts on record. It is introduced with the statement that this is a cause to which inversion has been "sometimes attributed," and as one which has been to a certain extent adopted "notably by the English [British] and American schools." As an historian of the subject, he is, however, compelled to show that this theory has been accepted by Denman, Saxtorph, Waller, Radford, Paul Dubois, Crosse, Tyler Smith, Klob, and Taylor of this country. The author quotes Galen to support his view that pressure by the abdominal muscles, which, Galen says, "are the external coats of the instrument of expulsion," is the one efficient cause. But Galen in the same extract may be as justly quoted in favour of uterine action; he says the "expulsive faculty" exercises itself immoderately, and admirably compares the uterus to a wrestler who, striving to throw his adversary, precipitates himself to the ground at the same time.

Astruc, 1761, was the first promulgator of this doctrine, notwithstanding the statement of so eminent a scholar and writer as Dr. West[1] that it was Saxtorph, 1804. Astruc is very clear; the accident is produced by "*agitations convulsives*" of the uterus; violent contractions, such as in the intestine cause colic and intussusception. Radford, 1837, taught the same with amplification, and in 1865 Paul Dubois described the mechanism as "a sort of spasm or irregular contraction similar to that which causes intestinal intussusception. It is a uterine invagination." The author omits all reference to Tyler Smith except by name. He was one of the strongest and clearest advocates of this doctrine, and his description of it Matthews Duncan copies into his essay as the best. Nor does the author anywhere allude to irregular contraction of the uterus, similar to what takes place in hour-glass contraction, as a probable mode in which the accident takes place, although many writers of eminence have seen between the two the closest resemblance. But, theory aside, there is on record the clearest proof of this, the active spontaneous form of uterine inversion.[2] It is true that the circumstances under which the accident occurs are not favourable to cool observation. In this respect it is like a death from anæsthetics. Yet there are cases which were carefully observed by men whose accuracy and whose testimony cannot be called in question, showing that inversion took place in this way. The author denies this mode of inversion, although he quotes Radford's case at length. "It is unacceptable, and in contradiction with the anatomical structure of the uterus, and with the most elementary principles of geometry." Then he gives a geometrical figure of the uterine muscular fibres, and makes an argument that from their structural course and the direction of their action it could not be thus produced. We prefer the argument by analogy, reasoning from the similar action of other hollow organs, and as to the geometry, the observed facts will best dispose of that; they are applied geometry. Of course, abdominal pressure is a concomitant of every expulsive effort, but to claim that it must therefore be the sole cause seems to be mere quibbling.

The diagnosis of uterine inversion is now well understood, and the sub-

[1] Diseases of Woman, p. 181.

[2] See especially one of Tyler Smith's cases, Trans. Obstet. Soc. vol. x; and a case in Cleveland Medical Gazette, June, 1860, p. 357; Radford's case, in his essay, and Dewees' case, in his Midwifery. Out of 142 cases in See's essay 23 were "spontaneous."

ject as treated in this work needs but little comment. Of historical interest are the cases and observations presented to the French Academy of Surgery during the last century, which seemed to demonstrate that the inverted uterus could be removed with entire safety. The specimens were hollow polypi. Details are given of forty-three cases in which an inverted uterus was taken for a polypus. Of these forty-three cases of error of diagnosis, the mistake was discovered in eleven before the operation; and of the thirty-two others in which it was only discovered during or after the operation, nineteen died and thirteen recovered. Many of the names of those who committed this error, some of them the most eminent in the annals of medicine and surgery, have already been given. In the list we do not find those of Sir Spencer Wells and Savage, said to belong there.[1] There have been many other instances of this mistake, and doubtless a larger number which have never been reported. The city in which the writer resides can furnish one. The patient died of shock, and the death passed as one from anæsthetics until many years afterwards, and just before the last medical man present passed off the stage of life.

There is a particular form of inversion complicated with polypus which presents the greatest difficulties in diagnosis. It is that in which the polypus is sessile, and is to all appearance an integral part of the fundus to which it is attached. A marked example of this kind is given by Dr. Emmet,[2] and an admirable one has been reported by Dr. Reamy.[3] The author also gives one, in which the pain caused by the écraseur led to a re-examination and discovery of the true condition; again exemplifying the wisdom of the maxim, that an anæsthetic should not be used in these operations. The points for a differential diagnosis between polypus and inversion of the uterus are stated to be five: 1, central and not lateral implantation of the pedicle; 2, the orifices of the Fallopian tubes at the inferior extremity of the tumour; 3, semi-reduction, which can be always obtained in inversions, never with polypi; 4, sensibility of the uterus, absent in polypus; 5, absence of the uterus as shown by rectal and vesical exploration. The last two are stated to be pathognomonic. But Dr. Emmet says that he has seen cases in which "the uterus was as little sensitive as a polypus," and in Dr. Reamy's case there was an ovoid body above the pubes corresponding to the uterus, and with lax abdominal walls, no cup-like depression could be felt. We are forced then to the conclusion that there are no pathognomonic or absolutely reliable symptoms to enable us to distinguish these two conditions, and the operator must proceed with a caution demanded by the knowledge of this fact.

To the treatment of inversion of the uterus the author devotes about four hundred pages, by far the larger part of the work. So many points of interest and of practical importance connected with this branch of the subject present themselves for consideration that it is difficult to make a selection. Some practical points deserve attention, and as the work of our countrymen is no mean part of the whole, it cannot be passed by. In the general view which opens the subject, the author lays down the rule of moderation in efforts at reduction: "the operator should never yield to the temptation to abridge by violence an undertaking the results of which should always be due to gentleness and perseverance."

[1] Trans. Am. Gyn. Soc., vol. vi. p. 283.
[2] Gynæcology, 2d ed., p. 413.
[3] Trans. Amer. Gyn. Soc., vol. vi.

"Some surgeons, on the contrary, notably among the Americans, have proposed, in cases where reduction is delayed, to pursue the taxis with persistence and increasing energy. They have even erected this practice into a method which they term *forced taxis*, and of which White,[1] of Buffalo, has been certainly one of the promoters. But if they have obtained some successes in this way they have paid dearly for them. They have often torn the vaginal culs-de-sac or ruptured the uterus, with consequent fatal peritonitis. Of ten cases collected by Barnes, no less than four were fatal. These figures alone show that this method should be totally abandoned."

As to the time when reduction should be undertaken, in acute cases of course the sooner the better, and he quotes Hunt of Buffalo, who shows the dangers of attempts made after the first day. For cases delayed longer, he says the practice has changed. In former times reduction was undertaken at any time; now involution is waited for. "The Anglo-American school is precise in its precepts upon this point: reduction should be attempted only before or after involution."

The author bases his classification of methods of reduction upon the means of fixing the uterus, and makes three divisions—the hypogastric, rectal, and vaginal methods. The former is subdivided into the taxis, *a*. central, *b*. peripheral, and *c*. lateral; and others, as the proceeding by the repositor of Viardel; of White; that by utero-sacral pressure of Barrier; utero-abdominal pressure of Emmet; that by vulvar incisions by Grillo; by the cervico-uterine incisions of Millot and of Barnes; by abdominal incision of Gaillard Thomas.

Central taxis, that process in which the fundus is first made to recede, originated, according to the author, with Viardel, 1674, and he first used a repositor, of which figures are given, and which has been adopted, modified, and improved by White. In peripheral taxis the body of the uterus is seized and compressed by the hand of the operator, and then carried upwards or rolled inwards. Its germs are found in Ambrose Paré and Mauriceau, and it has had a continuous line of adherents down to the time of Paget, Tarnier, and Montgomery. Lateral taxis is reduction by depression of one horn of the uterus; it is attributed to Deleurye, 1787, and his case and description given, but the originator did not appreciate the physiological and anatomical bases on which the procedure rests.

"An analogous method had been successfully adopted by Burns. But it is two American surgeons, Sims, in 1860, and Noeggerath, in 1862, who have given to this form of taxis its definite form."

Then follow the reported cases of these gentlemen.

The repositor, as an instrument of reduction, had passed into forgetfulness when it was revived by White of Buffalo "in a form more reasonable and less brutal." We are informed in a note that by American surgeons White is considered as the "inventor of the reduction of chronic inversions, while his first case dates nine years after Valentin's, five years after Canney's and Barrier's, and in the same year as that of Tyler Smith." But our countryman's honour does not rest on a single case, but on persevering effort and repeated successes which finally placed the reduction of chronic inversion in the list of legitimate and recognized operations, and on the invention of an instrument especially adapted to, and an efficient aid in, the reduction of chronic inversions. This is evident as the author traces the history of the development of the repositor from the rectal

[1] Our lamented friend appears in these pages always as "*Withe*."

bougie, which was used at first, to its present form, although he cannot accord any more praise than to say that it is an instrument which "merits certainly all the attention of surgeons." White's early cases are given, and one by Mendenhall reduced by the same method. The first attempts were not encouraging; White's first patient died in seventy-four hours, his third of peritonitis in a few days—two deaths out of the first four cases. Still he persevered in spite of failure, and by this men show their qualities, win success, and deserve honour. In the following paragraph, and especially in the parts we have italicized, we find a just estimate of Dr. White's instrument, and the evidence that its merits are finally recognized.

"The instrument as *brought to perfection* by White *completely changes, in fact, the conditions of its employment.* It is no more the simple repositor of Viardel, effecting central taxis, but an instrument *solely applicable to chronic inversions*, seizing the fundus of the uterus, elevating it as a whole, permitting at the same time the fingers of the right hand to manipulate the body and the pedicle, *substituting*, in a word, *the peripheral taxis for the central*, which much diminishes the danger and augments the chances of success. Farther, thanks to *the spring resting on the operator's breast*, he can use his fingers for an indefinite time, having the opportunity of resting from time to time without losing what he has gained."

The "method of Emmet" the author terms "uterine unrolling by utero-abdominal pressure," which means that the external hand, instead of simply fixing the uterus against the pressure below, becomes an active agent and assists materially in unfolding the inverted organ. This manœuvre was distinctly described by White, as the author admits, but he claims that Emmet emphasized and insisted on it. This is certainly a misapprehension of Emmet's distinctive method, arising probably from quoting him second-hand. Two of Emmet's cases are given illustrating the method, but Emmet's Gynæcology is not referred to. In that the chief point of his method is stated to be the insertion of the fingers in the sulcus around the body, pressure upwards with them, and dilatation by spreading the fingers outwards, a method which, to be effective, requires especially great digital power. All this seems to have escaped the author's notice.

The "method of Gaillard Thomas," by abdominal incision, is then described with illustration, his case detailed, and his plea for the procedure, when all other resources have been exhausted, presented. In regard to the merits of the plan the author expresses no opinion, merely stating that Thomas has as yet found no imitators, and probably will not.

In the "rectal method" the counter-pressure, or fixation of the uterus, is effected by the fingers in the rectum hooked into the uterine fold or edge. This method is also called "Courty's," although first proposed by Kilian. The author disposes of it very briefly; he gives but one of Courty's cases, and one by Dawson of New York; but his opinion of it is very unfavourable, as likely to cause lacerations of the rectum and serious injuries. Unfortunately he does not mention Tate's case,[1] in which, at Dr. Dandridge's suggestion, a finger was also passed into the bladder, and the reduction then effected. If further experience shows this plan to be applicable to any considerable proportion of cases, it will be one of the most valuable contributions ever made to the subject.

Reduction by the vaginal method is subdivided into the "rapid" and "slow." The former is Aran's method, and has been followed by Courty;

[1] Cincinnati Lancet and Observer, March, 1878.

one case by each. It consists in seizing the cervix by one or more Museaux forceps, and thus fixing it while pressure is applied to the body or fundus of the uterus. The consideration of the "slow" method opens with Emmet's plan of stitching with wire the cervix over the body, when reduction has been partially effected, and thus continuing the force in the intervals of taxis. It is fully described, illustration given, Emmet's cases detailed, and one by Lombe Atthill, said by the author to be the only follower of our countryman in this method.

"Emmet's proceeding appears to be now about abandoned, less, perhaps, on account of the dangers and difficulties of the operation than of the far greater simplicity and the entire innocuousness of other proceedings, at least as powerful, which we have yet to describe."

These "other proceedings" are the various instruments and pessaries which are introduced into the vagina to effect reduction by slow and continuous pressure. As these instruments are numerous, and as there are scattered cases from early times, in which some one of them has been used, this branch of the subject takes up considerable space. Again our countrymen lead off. The case of Smart[1] is considered most important, from its early date and from the time at which it was applied—three weeks after parturition—the transition period between recent and chronic cases. Then come the fixed pessary of Amussat and Gariel's air pessary, with which Tyler Smith attained great success, "thanks to caoutchouc." Next follows an account of the water pessary of Wetterlein; and afterwards of the pessaries with elastic bands, originated by Barnes, adopted and improved by Matthews Duncan and Aveling. These instruments are described, figured, compared, and commented on by the author far beyond what our space will permit, and we must be content with giving his summing up, remarking only that he places a higher estimate upon them than, in our opinion, gynæcologists of this country are willing to accord, although fully granting their value.

"Of the hypogastric methods, the central taxis is especially applicable to recent inversions, the uterus being voluminous and in a state of inertia.

"The peripheral taxis is applicable to all cases where the uterus is not too large.

"The lateral taxis offers equal advantages, and, at the same time, great facility of execution and the greatest chances of success. It is the method which should be preferred whenever it is possible to employ it. . . . .

"As to the other proceedings under the hypogastric method, they appear to be rather scientific curiosities than practical means. We reject absolutely the repositor of Viardel and the hypogastric incision of Thomas. We believe that lateral or peripheral taxis may always be advantageously substituted for the procedure of Barrier and the hypogastric unrolling of Emmet. As to the repositor of White, and the cervical incisions of Barnes, they are in reality only exceptional resources, which may facilitate the taxis in some circumstances, which we should not disdain, but which we cannot accept as ordinary methods. . . .

"The slow utero-vaginal method has given such happy and unexpected results that it must be considered as one of the triumphs of modern surgery.

"The surgeon now in presence of a chronic uterine inversion should, it appears to me, devote all his attention to this method under its two forms. He should make a tentative trial of the lateral taxis; this not succeeding, he should attempt slow reduction by the air or water pessary; then make another cautious trial, and employ, if necessary, White's repositor. If this does not succeed, let the patient rest a few days, and then recommence. . . . . The operator will always be able to make such special modifications as exceptional conditions in the case may render necessary."

[1] Quoted from this Journal, 1833, vol. xvi. pp. 81 and 251.

Some uterine inversions cannot be reduced, however skilful the operator or whatever means may be resorted to, and a very considerable mortality attends attempts at reduction. Upon the latter point the author's statistics cannot but prove interesting, although they must be very far from complete. He has collected 80 cases of recent inversion, occurring between 1850 and 1880, of which 14 proved fatal and one irreducible: 18 per cent. Lee,[1] in his essay, gives 44 cases with 5 deaths. The author feels certain that all the cures are published, while many of the failures are never known.

He gives 20 cases of reduction before involution is complete, or within forty days after labour; of these 2 were fatal: 10 per cent.

Of chronic inversions he has collected 84 cases, since the first by Valentin in 1847, with 2 deaths, or about 6 per cent.

He gives no successful case of as long standing as Dr. Tate's, of this country: one in the thirteenth year and one in the twenty-second, being the highest.

All attempts at reduction having failed, there remains ablation of the organ for patients who demand or need it. To this subject a considerable portion of the book is devoted (no less than two hundred and thirty pages), and it is considered as fully, and with as much detail, as the other parts. There are four modes of performing the operation: 1, excision by the knife; 2, by the écraseur; 3, cauterization; 4, removal by the ligature, fixed, progressive or repeated, and elastic. It is an operation which began almost by accident, has been performed by ignorant midwives and bone-setters, often giving example of how much the human frame can go through and survive, until, improved and modified by surgeons, effected by ingenious instruments and methods, it has shown a constantly decreasing mortality, and arrived at a success which cannot but be cause for congratulation. There was no intention of touching upon this section, but some points cannot be passed by. When foreigners give our countrymen praise, it certainly ought to be known at home. For instance, the author gives a successful case by the method of the progressive ligature, which consists in gradually tightening the constriction, reported by Bartlett,[2] the anatomical specimen of which is stated to be in the museum of the St. Louis Medical College, and shown annually to the class by Prof. Pallen. After commenting on the singular fact that this case, although it occurred in 1842, was not published until 1875, he says:—

"It must not be forgotten that this case dates from 1842, and that it is by an American surgeon. Now, if the American school has since given origin to much upon this subject we are considering, there was at that time no question of this kind of operation. It appears to me just to recognize that Bartlett was, as he himself thinks, the first surgeon who performed the operation in America. At the first step he ascended to the level of the masters of the art, and showed himself to be at once the worthy emulator of his contemporaries of the English school, Johnson and Crosse, and the precursor in his own country of that Pleiad of surgeons who should shine with so much brilliancy in the American school.

"Another very important point in Bartlett's case is that if he was the first to perform this operation in America he was also the first to perform it, even includ-

[1] A Statistical Inquiry into the Causes, Symptoms, Pathology, and Treatment of Inversion of the Womb. By Chas. A. Lee, M.D., Amer. Journ. of Med. Sciences, Oct. 1860.

The author has not met with this most important and admirable contribution to the subject.

[2] Quoted from Med. Press and Circ., 1875; L'Union Méd., 1876; and Gosselin, Clinique, t. iii. p. 122.

ing Europe, by the aid of a mechanical *serre-nœud*, an instrument which dates from about 1840.

"He made use then of the screw *serre-nœud*, while Johnson and Crosse yet employed Gooch's canula, and he laid down with a precision which could not be surpassed, the manner in which this instrument should be used, by recommending that the ligature should only be drawn, in the beginning, to the production of pain, and afterwards to tighten it gradually and almost with mathematical precision, making only one turn of the screw every twenty-four hours. There was only lacking to him, for the attainment of perfection in the use of the instrument and in its employment, the use of a metallic ligature sufficiently strong to bear the strain."

The method of removal by the elastic ligature deserves a moment's attention as among the later and growing operations, and from the great success it has given. It originated with Courty in 1874, and cases are reported in this work as late as 1882. It has been applied in a variety of ways, with and without mechanical device, and sometimes with a preceding furrow made by caustic, a modification which is judged to be worse than unnecessary. The time required for removal of the uterus in this way is from ten to fifteen days.

"In comparing cases it cannot but be seen that foreign surgeons have a certain repugnance to this method, and that, from fear of septicæmia, they make great haste to get rid of the tumour as soon as it has been tied, which always entails certain troubles and certain dangers.

"The French surgeons prefer not to interfere until the tumour is eliminated spontaneously, combating the perils of septicæmia by antiseptic dressings. An analysis of several of the cases we have reported seems to show that they are right."

The following table deserves place, but we cannot enter into a statement of differing mortality of ablation for puerperal or polypoid inversion, or into various comparisons and computations which are to be found in the pages of the work.

Excision . . .	18 cases,	6 deaths,	33.33 per cent.
Ecrasement . .	23 "	5 "	21.30 "
Cauterization . .	9 "	5 "	55.55 "
Ligature, fixed .	30 "	9 "	30. "
" progressive	63 "	10 "	15.87 "
" elastic .	13 "	1 "	7.70 "

If to these thirteen cases by the elastic ligature we add the Italian statistics,[1] and but one case in the author's collection seems to be Italian, seven cases without a death, the comparative position of this mode of operation is striking.

While we have found some errors in this book, some few things lacking, and some opinions with which we cannot agree, it is but justice to say that the author has given us a work containing fine scholarship, evidence of patient and laborious research, and good judgment, and one which no student of the subject can afford to overlook. J. C. R.

[1] Medical News, April 12, 1884, p. 416.

ART. XX.—*Transactions of the American Gynæcological Society.* Vol. VIII. for the year 1883. 8vo. pp. 276. New York: D. Appleton & Co., 1884.

THIS volume opens with a paper on *Superinvolution of the Uterus*, by JOSEPH TABER JOHNSON, M.D., of Washington, D. C. This term is credited to Sir James Y. Simpson, who regarded the condition of disease as irremediable. The limit to the process of contraction, absorption, disintegration, and restoration of the uterus after enlargement, under the pregnant state, or other conditions, is usually so regulated and controlled by the forces of nature, that the organ is left in a condition for impregnation and gestation. But there are exceptional cases, in which the process is not arrested, until the uterus is reduced below its virgin size, and its tissues condensed, so that although not precisely in the state produced by senile atrophy, its condition is equivalent to it, as a general rule (although there are some exceptions), as far as the future sexual power of the viscus is concerned. With this atrophic condition of the uterus, there is usually a corresponding shrinkage and change in the ovaries, so that ovulation is arrested and menstruation ceases; but there are exceptional cases, as described by Prof. Barker, in which the ovaries remain active, and the menstrual hyperæmia, not being suitably relieved by a uterine flow, gives rise to serious derangements of health. The author writes in regard to the application of the term used as follows:—

"*Super*-involution only occurs after the process of involution has been once set in progress by the emptying of a uterus once occupied by some mass or body which has produced its increase in size beyond the normal point, as, for instance, after cases of hydrometra, pyometra, hydatids, the removal of the various uterine tumours, as well as the conclusion of utero-gestation or abortion."

The extent of excess in the process of involution varies with the case, the uterus being but slightly diminished in some instances, and in rare exceptional ones entirely removed, as well as the ovaries.

Dr. Johnson reports four typical cases which occurred in his practice, the women being of the ages of twenty-six, thirty, twenty-nine, and twenty-seven years respectively. Case 1 had borne one child. Case 2 was childless, but had been the subject of hydrometra. Case 3 had never been pregnant, although she had menstruated painfully and irregularly for twelve years. Hers was not properly a condition of super-involution, but of defective development, although in dimensions and character her uterus and condition were analogous to those of the others. Case 4 had had two children, both of which were dead. Case 1 had ceased to menstruate after her conception. Case 2 menstruated half a day, and finally lost but a trace. In Case 3, the flow was irregular and scanty, and in Case 4, it lasted but a few hours, becoming thin and light-coloured. Galvanic treatment failed to restore a single case.

Prof. Fordyce Barker reported two cases in which a cure was effected, the ovarian function having continued notwithstanding the atrophic size of the uterus. No. 1 miscarried at six months of her first child, superinvolution took place; she was under treatment three years, and finally conceived and bore a living child. No. 2 also miscarried as a primipara at six months, and became pregnant under treatment. In No. 1, the uterine depth was one inch and a quarter, and in No. 2, there was a perceptible growth of the organ under the galvanic treatment. He proposed

to consider the diseased condition under two types, one amenable to treatment, because of the continuance of ovarian action, the other the reverse.

A paper on *Cleanliness in Surgery*, by Dr. R. Stansbury Sutton, of Pittsburg, makes a careful examination into the causes of success in antiseptic surgery, with its association of cleanly precautions and measures, as compared with the use of the carbolic spray and carbolized sponges and instruments. The author believes that the Lister method owes more to the antiseptic and cleanly prophylaxis than to the germicidal power of carbolic acid employed, and instances the practical results of operations with and without spray as witnessed by him under many celebrated gynæcologists in Great Britain and on the Continent. Of the carbolic spray he writes:—

"Dr. Keith dropped the spray, and proved by one hundred cases of ovariotomy done without it, that his results were better than in one hundred cases done under it. Dr. Bantock systematically reduced the carbolic acid in the spray until he used only pure water; his results were lower temperatures after operations, and more favourable recoveries. As a result, he gave up the use of carbolic acid, both in the spray and in the pans. Mr. Lawson Tait fell into line with his Scotch colleagues, Keith and Bantock, and led the charge against the entire carbolic system; and these three great men have, so far as abdominal surgery goes, proven the worthlessness of the carbolic acid spray feature of Listerism. All the details of cleanliness attached to the antiseptic method they believe in."

The precautionary directions for surgical operations are given by Dr. Sutton as follows:—

All vessels used in an operation should be of glass or porcelain. The water should be boiled, and, still better, filtered or distilled. For irrigation, and cleaning of sponges and instruments it may be carbolized. Sponges after preparation should be covered up, and after an operation cleaned by the surgeon himself to secure a proper ablution. Towels, as always used by Kœberlé for the interior of the abdomen, may be substituted for them. Instruments should never be dried after use until they have been thoroughly washed and wiped, as blood and pus when dried on are difficult to remove. Instruments, sponges, and ligatures should be handled only by the operator and one assistant. In cleaning instruments, pass the eyes of needles and tips of forceps through an alcohol flame. Prior to the next operation clean and scald all instruments. Treat silk ligatures with five per cent. carbolic acid, or scald before use. Boiling for an hour in plain or carbolized water is still better. Assistants should have clean clothing and hands, washing the latter and forearms in turpentine and then in washing-soda just prior to use. The operator should have for use a basin of clean, warm, carbolized water in which to rinse his hands when soiled by foreign matters. Nurses should receive and convey sponges to and from the washer on plates. If menstruating, they should not be present in intra-abdominal cases. Surgical dressings should be kept in covered vessels of glass or tin securely closed up. In intraperitoneal cases there should be but few assistants and spectators.

Hot Water in Secondary Hemorrhage after Pelvic Operations is advocated by Albert H. Smith, M.D., of Philadelphia. The use of hot water at a temperature of 115° to 120° as a hæmostatic, applied either by wet compress or douche, has become well known in this city, from many favourable results obtained by it, and this paper was prepared by Dr. Smith for the purpose of bringing the process into more general use. The credit of first suggesting the application is given to Dr. Pitcher of Detroit, who recommended its use twenty-five years ago.

Dr. Smith says that for six years he has made it a rule to inject the hot water into the vagina, and if necessary into the uterus, after every labour, simple or complicated, the object being to check hemorrhage and avoid septic infection, the fluid being rendered aseptic by some disinfectant. The injection is continued until all clots are removed and the water comes away colourless. He claimed that this secured a firm contraction of the uterus; prevented secondary relaxation almost universally; checked the occurrence of after-pains, and added to the comfort of the patient.

Dr. Smith especially recommended hot water as a hæmostatic in surgical operations, and more particularly in those of a plastic character, and commended its employment in sudden hemorrhage from large blood-vessels.

Some Points connected with the Subject of Dysmenorrhœa is the title of a paper by C. D. PALMER, M.D., of Cincinnati. Recent observations and investigations have changed materially the at one period prevalent opinions as to the causes and methods of treatment of dysmenorrhœa, and many of the cases attributed to mechanical obstructions of the cervix, either from congestion, flexure, or stenosis, are now known, from tests made during menstruation, to have their origin in the portion of the uterus giving out the fluid; the pain experienced being located in the nerves of the body of the organ rather than in its neck, and directly rather than indirectly produced. The following varieties of cases are noted by the author:—

"1. Instances of dysmenorrhœa where no abnormal condition of the uterus as to size, shape, position, circulation (in the whole organ or in part), or in the ovaries or pelvic tissues, can be detected on the most thorough examination."

"2. Instances in which there are well-defined abnormities of the uterus, as pin-hole os, elongated cervix, constricted canal, flattened and ill-developed body, flexion (ante-), and no dysmenorrhœa."

"3. Instances of stenosis of the os externum, of marked kind and degree, the result of chronic inflammation or the vicious use of caustics, and no menstrual pain."

"4. Instances of well-defined acquired flexion of the uterus, and no dysmenorrhœa."

"5. Instances of stenosis of the os externum and cervical canal, associated with dysmenorrhœa, where treatment of a surgical nature proves successful in the relief of the former, while temporary or no relief attends the latter."

"6. Instances of uteri with patulous canal, and dysmenorrhœa."

The author also remarks, "It has been claimed that the benefits obtained by dilatation with bougies and cutting instruments prove conclusively the obstructive nature of the disease. The argument is faulty. Experience shows that such results are by no means uniform or constant, and if they were, other explanations are not wanting."

There is something very questionable in the theory of mechanical obstruction of the cervix being the cause of pain, except in cases in which the canal, through stenosis and congestion, is entirely closed up. We have only to consider that one drop of blood passing through the cervix each minute will amount to f℥iij in twenty-four hours, or a much larger amount than is lost at the maximum, by the subjects of menstrual pain. We are taught that a woman menstruates on the average from 5 to 7 days and voids from f℥v to f℥vij, the diurnal maximum being f℥ij. At this rate, less than a fluidrachm will pass per hour; an amount that would readily escape through a pin-hole. We must then look for other causes for the pain in a large majority of cases.

According to Dr. Palmer, page 110 :—

"Dysmenorrhœa is a functional disorder of the uterus, and its essential and underlying nature a neurosis. It presents many features analogous to other visceral neuralgias. Associated or not with organic disease, sometimes developed, more often aggravated by them, clinical evidence points to the idea that the neurotic is the only feature in most cases, and is manifested to a greater or less extent in all." He attributes this abnormal condition to a defective temperament, "often the penalty of a poor inheritance, a bad hygiene, a forced education, and the false stimulus of our modern and artificial life.". . . (Page 112.) "Pain is developed by the local influx of blood to and within an organ the seat of a neurosis, either purely local or a local expression of a general nervous disorder, very generally antedating any organic lesion, and almost always aggravated by such as become acquired.". . . . "The neurotic form of the disease is the most frequent; is attendant with most severe pain, and, excepting the membranous, the most difficult to permanently relieve if it has continued for a long time."

Among other remedies in more common use, the author recommends a concentrated tincture of cimicifuga, given in moderate doses for three days before the period, and continued in smaller ones at short intervals during the prevalence of pain; and the tincture of pulsatilla given in the same way. He explains the *modus operandi* of dilatation of the cervix, not by its affording a freer exit for the blood, but by the effect of the instrument in blunting the sensibility of the inner uterus, and in stretching or rupturing the irritable fibres of the internal sphincter of the organ, thus affording relief as in stretching the anus for fissure, and the female urethra for irritable bladder.

Dr. Chadwick had used the bromides, 10 to 30 grs. three times a day, with good effect, in neurotic cases, beginning a week prior to the attack; and stimulated the patients during the period with cocoa and carbonate of ammonium. He had no faith in the claim that flexures produced dysmenorrhœa.

Dr. Barker referred specially to a class of cases in which pain did not exist for two or three days after menstruation began, the patients being of full habit, muscular and vigorous, who prior to the period complained of vertigo, headache, imperfect vision, tenderness and pain in the breasts, backache, etc. He attributed these phenomena to ovarian excitement without a corresponding relief of the hyperæmia by uterine discharge; such cases he treated by the bromide of sodium, 10 to 15 grains between breakfast and lunch, lunch and dinner, and at bedtime. He found apiol also adapted to this class of cases.

Dr. Edward W. Jenks, of Chicago, describes *A New Mode of Operating for Fistula in Ano.* Like the story of Columbus and the egg, the merit lies in the simplicity of the method and its originality. It is nothing more than cutting down through the sphincter ani to the fistulous tube, dissecting it out with scissors, securing any vessels by pincettes, or, if required, by ligation, and closing the wound as in perineal laceration, so as to secure immediate union, and retain the integrity of the sphincter muscle. The plan has answered admirably in Dr. Jenks's hands, as we can easily see it might in many cases where the tube of the fistula to be dissected out is of small calibre and like a vein in appearance. Dr. Jenks keeps the bowels inactive for nine days, and uses silk ligatures for the rectal wound, to be left in. In cases in which the external sphincter has become rigid, he recommends that it should be stretched forcibly with the thumbs before incising it, or incised opposite the fistula deep enough to paralyze the muscle.

Dr. CHARLES CARROLL LEE, of New York, presents a paper on *The Management of Accidental Puncture and other Injuries of the Gravid Uterus, as Complications of Laparotomy*, based upon the favourable result of his treatment of a case in which he accidentally punctured a pregnant uterus after making a proper diagnosis of the association of cystoma ovarii and pregnancy. After opening the abdomen and locating the cyst, he turned the patient on her side and punctured, not the cyst—which, having a long pedicle, slipped up under the liver—but the uterus, which rose into its place. The uterus, being but three months impregnated, and having thick walls, and the trocar puncturing it obliquely at the fundus, the cavity of the organ was not perforated, the liquor amnii did not escape, and no abortion resulted. After removing the ovarian cyst and dropping in its pedicle, Dr. Lee closed the uterine wound with a continuous suture of carbolized silk, carried through with a round-pointed needle, and the patient recovered. Five weeks later the patient fell down stairs and aborted of a fœtus, which appeared to be of about four and a half months. The woman again recovered.

The author argues, from the result of this case, that where the finger detects no penetration of the uterine wall, and there is no escape of amniotic fluid, there need not follow an abortion, and that the Cæsarean section, as in the Byford and Spencer Wells cases, will not be imperative.

Dr. Byford was disposed to draw a distinction between pregnancies in the earlier and later months, and to believe that what might be proper and practicable at three months, as in Dr. Lee's case, would not be in advanced pregnancy, because of the changes effected in the uterine tissues, rendering the suturing of the organ impracticable until after its evacuation, its muscular contractions excited by the puncture being capable of tearing out any inserted stitches. He advised that the plan of Dr. Lee should be restricted to the early months of gestation, and that after seven or eight months the uterus should be evacuated by incision and then sewed up.

Is the Extirpation of the Cancerous Uterus a Justifiable Operation? is discussed by A. REEVES JACKSON, M.D., of Chicago. After an examination of the results of removing cancers of the breast and cancerous uteri, the author remarks as follows:—

"Other methods of treatment less dangerous than extirpation of the uterus are equally or even more useful." . . . "So far, experience seems to have proven that all operations of radical grade are either of doubtful benefit or positively injurious; for while in some cases the symptoms are ameliorated, the improvement is usually of short duration, and they may be fairly offset by the others in which the interference accelerates the growth."

Dr. Jackson presents his views of the whole subject in the following summary:—

"1. Diagnosis of uterine cancer cannot be made sufficiently early to insure its complete removal by extirpation of the uterus."

"2. When the diagnosis can be established, there is no reasonable hope for a radical cure; and other methods of treatment far less dangerous than excision of the entire organ are equally effectual in ameliorating suffering, retarding the progress of the disease, and prolonging life."

"3. Extirpation of the cancerous uterus is a highly dangerous operation, and neither lessens suffering, except in those whom it kills, nor gives reasonable promise of permanent cure in those who recover. Hence it fails in all the essentials of a beneficial operative procedure, and should not be adopted in modern surgery."

Dr. Van de Warker fully agreed with Dr. Jackson in his views. He was in the habit of removing uterine cancer by charging the organ with a saturated solution of chloride of zinc, and causing it to slowly slough out. He first used the knife and curette on the cervix and body, and then to arrest hemorrhage, packed in with cotton wet in a solution of persulphate of iron, and afterward with the same, charged with that of the chloride of zinc, protecting the vagina with a pomade of bicarbonate of sodium in vaseline.

Drs. Emmet, Barker, and Palmer (of Cincinnati) endorsed the opinions of the author of the paper. Dr. Sutton, of Pittsburg, after having seen many operations in Europe, as well as having operated himself upon five subjects, was in favour of the operation.

In a paper on *A Study of the Etiology of Perineal Laceration, with a New Method for its Proper Repair*, Dr. Thomas Addis Emmet, of New York, claims that the ills resulting from laceration of the perineum in cases in which the sphincter ani is not ruptured are due to causes other than the splitting of the perineal body and the perineal tissues; that the entire restoration of the torn parts does not in many cases relieve the patient of the disabilities thought to be due to the loss of vaginal support; that the laceration of the perineum may occasion no inconvenience after the raw surfaces have healed over in cases of extensive tear, and gives rise to great inconvenience where the amount of rupture is comparatively slight; and that a woman may suffer the ills usual after a bad laceration without the external parts having given way. This the author attributes to the forcible elongation and relaxation of the posterior wall of the vagina produced by the pressure of the fœtal head upon the perineum, and proposes to remedy it by taking out a transverse section at the vagino-perineal junction, and stitching up the wound so as to shorten the wall. He says, in explanation of his views, the following, page 199:—

"We can all recall instances illustrating the condition where the perineum, even in the case of labouring women, had been lacerated for years with no discomfort, notwithstanding the vaginal outlet had remained so open that it was a matter of surprise to find the pelvic organs in place. On the other hand, have we not been as often puzzled at the amount of suffering attending the slightest degree of injury?"

"And it is quite common to meet with instances where the vaginal outlet is relaxed, as the mouth of a bag would be, from which the running string had been withdrawn. In these cases no apparent loss of the perineum can be detected, and yet the same train of symptoms exists as in the other conditions"

"Experience, I think, will bear me out in the statement that no operation, performed for the cure of the ills attributed to a want of support after a loss of the perineum, will give the needed relief unless some portion of the posterior vaginal wall be invested in the line of union. If this be not done, it will matter little how extensive a surface has been united, even to closing the canal, if this be accomplished by only bringing together the tissues at the vaginal entrance."

Operation.—"The patient is to be placed on the back, with the legs flexed over the abdomen, so that the labia may be well separated by an assistant. The vaginal outlet will thus be fully opened so as to expose the carunculæ on each side. If the lower portion of these be seized by a tenaculum in each hand, together with the corresponding surface on the posterior wall of the vagina, and the three points be thus brought together, it will be easy to map out the surfaces which are to be united." . . . "It is usual to introduce on each side a suture through the labial tissue to the centre of the fold which is to be drawn up from the posterior vaginal wall, and, as a rule, not more than two or three sutures are required to secure each horn of the crescentic line. While an assistant holds with a tenaculum the posterior flap in position, these sutures are to be secured,

beginning in the angles and alternating from one side to the other. When they have all been twisted or tied, and the vaginal outlet has been drawn up to the condition existing before the first childbirth, there will still remain to be closed in front the laceration through the perineum. It is seldom that more than three sutures are required to secure this line. But, before introducing them, an assistant should make, with a tenaculum, moderate traction from the external angle, so as to bring the line thus formed by the two folds down to the level of the surrounding mucous membrane or skin. When these sutures have been secured, and the labia have been allowed to close together, it is seldom that any portion of the line of union will remain in view." Page 207.

To comprehend fully the meaning of these directions, which are somewhat obscure, there should have been a drawing to accompany them. It was evident, at the time the paper was read, that the members of the society were very much at a loss to comprehend the steps of the operation as described. In the discussion it was explained that two crescentic lines of surface were to be denuded, but not the ellipse between them, for fear of forming a cicatricial band to give trouble at a future day. It was evident at the time the paper was read that members were not inclined to regard the perineal body as unimportant, or the union of the divided parts as non-essential in the operation of restoration. We do not see how it is possible to lift up and "bring up to the vaginal level" the posterior vaginal wall, when it has been rift to the outer surface of the rectum. Within the last year the reviewer met with the case of a lady in whom the vagina was torn almost into the rectum, and the perineal body divided, but there still remained three-quarters of an inch of vulvo-rectal skin as the remains of a two-and-a-quarter-inch perineum. R. P. H.

ART. XXI.—*Medico-Chirurgical Transactions.* Published by the Royal Medical and Chirurgical Society of London. 8vo. pp. lxxxii., 378. London: Longmans, Green, Reader & Dyer, 1883.

SPEAKING first of those articles that are surgical, it can be safely said that they are valuable as recording some good work done, while their general ability, scientific thoroughness, and literary finish make the present volume in every respect a notable one.

The introductory paper is the *Address*, delivered at the annual meeting, March, 1883, by the President, JOHN MARSHALL, F.R.S., entirely devoted to biographical notices of Fellows of the Society whose deaths had occurred during the previous year. The number is unusually large, including the names of many who enjoyed a very wide reputation. Among them we notice those of Sir Thomas Watson, Drs. Peacock, Budd, and Draper, Messrs. Critchett, Clover, and Charles Darwin. The address is very agreeably written, exhibits much painstaking care on the part of its author, and fittingly opens a volume devoted to the ills of mortality, with reminders of the tribute necessarily paid that great enemy by those whose lifework is spent in combat with it.

Mr. RICHARD BARWELL, F.R.C.S., Senior Surgeon to Charing-Cross Hospital, contributes the first distinctively technical paper, *On Dislocation of the Foot with Version, and Torsion of the Astragalus.* There is given a detailed account of a case in which the astragalus had undergone almost

complete twisting; and in which, while the articular facets of the bone were entirely changed, the bone yet remained between the malleoli, and was not broken. All attempts at reduction proving fruitless, the bone was excised by means of a semilunar incision, extending from the middle of the lower end of the tibia to the tip of the outer malleolus. The extensor tendons and the anterior tibial artery were so pressed inwards that they were not injured, while the tendon of the peroneus tertius was not seen. With the aid of lion forceps, and a few touches of the knife to remaining ligamentous attachments, the astragalus was easily removed, and the man made a good recovery. Mr. Barwell thinks that the judgment of authors, that diagnosis in these cases is impossible, is erroneous; and that, with correct anatomical knowledge, and in the absence of swelling—which was the condition in his case—the difficulty is not insuperable. A careful study is made of other reported cases of this injury, and in an appendix are given the details. Altogether the article is a valuable contribution to a very important and obscure class of surgical accidents, and one which cannot be disregarded by students.

On Resection of Portions of Intestine is the title of an interesting article by Mr. Frederick Treves, F.R.C.S, Assistant Surgeon to the London Hospital. A study of the cases reported, in which various portions of the bowel have been removed, convinced the author of this paper that the mechanical difficulties in the way of a successful performance of the operation are great. Believing, also, that in many cases the operation offers the best prospects, Mr. Treves set himself to devising some means to facilitate its performance, and also aid the surgeon in the introduction of the numerous sutures called for. The result is the production of a double clamp, which can first be applied below the part to be excised, and then, after pressing the contents of the gut upwards, above that part. When this is done the cut ends of the bowel are both firmly grasped in the instrument, and can be freely manipulated by the surgeon without alteration of their relative positions. To further aid in keeping the parts in accurate apposition while the sutures are being placed, Mr. Treves recommends the insertion of a delicate India-rubber bag into either end of the divided intestine. This bag is then inflated with air, and the circumference of the bowel being maintained by it there is much less difficulty experienced in introducing the sutures. Just before the last suture is placed the bag is exhausted of its air through the pipe which has occupied the suture line, and so delicate is the tissue that it can be withdrawn through a hole having the circumference of a No. 13 catheter. Mr. Treves gives the history of one case in which he resected a part of the descending colon for an epitheliomatous stricture. The operation was done under full antiseptic precautions, twenty-five sutures being applied according to Lembert's method; but the patient, who was much exhausted, succumbed with beginning peritonitis within twelve hours. The construction of Mr. Treves' instrument is made plainer by the cut accompanying his paper than is possible by any mere verbal description, and it certainly appears to be worthy of further trial. It is right to add that the paper contains as well a careful and judicious study of many of the steps connected with the operation.

Mr. Christopher Heath, F.R.C.S., of University College Hospital, narrates a case of *Aneurism of the External Carotid Artery*, occurring on the right side, in the person of a woman aged 23 years, with extensive cardiac disease. The diagnosis was facilitated by the fact

that one-half of the tongue was atrophied, which condition was attributed to pressure upon the hypoglossal nerve where it crosses the external carotid. Mr. Heath ligated the common carotid with carbolized silk. On the seventh day the wound was healed, and on the tenth all pulsation in the aneurism had ceased. Contraction of the sac ensued, and everything progressed favourably until the thirty-third day, when symptoms of paralysis occurred, and the patient died in forty-eight hours. Upon post-mortem examination an embolus was found at the base of Broca's convolution, with some small patches of yellow softening. These fatal changes were attributed to the passage through the left carotid of a loosened vegetation from either the much-encrusted cardiac or aortic valves. The aneurism, filled with firm laminated clot, was found to spring from the external carotid about half an inch above the bifurcation. The ligature was surrounded and permeated by young fibrous tissue rich in cells. Mr. Heath thinks that the case is especially worthy of notice, as showing that ligature of the common carotid can cure aneurisms seated near the bifurcation, and that it is unnecessary to have recourse to the old operation of opening the sac and applying distal ligatures to the external carotid, facial, superior thyroid, and lingual, as recommended by Mr. Henry Morris in the sixty-fourth volume of the Transactions.

The next paper is one telling of an *Aneurism of the Arch of the Aorta* in which *Ligature of the Right Subclavian and Carotid Arteries* was practised by HOWARD MARSH, F.R.C.S., of St. Bartholomew's Hospital. The ligature used was chromicized catgut, furnished by Dr. MacEwen, of Glasgow. The operation was done with full Listerian precautions, and was followed by a diminution of pain. But while there was less prominence and pulsation in front, where it had been previously most marked, there was at once an increase of both towards the left side. On the fifty-first day after the operation, and after several preliminary hemorrhages, the patient died. The friends refused to allow an autopsy to be made, and the case is, therefore, incomplete. From the fact that there was an extension of the disease in a new direction, as an immediate consequence of the ligations practised, Mr. Marsh discusses the advisability of a resort to an operation in similar cases. In none of the nine cases in which distal ligatures have been tried has a complete cure resulted, although there was much alleviation of many of the symptoms. Whether this relief was dependent upon the enforced rest made necessary by the operation is a question which has been raised by some surgeons, but which Mr. Marsh thinks is not in keeping with the facts of the cases recorded. He would rather attribute it to the fact, not sufficiently recognized, though one of general experience, that sometimes a very slight interference will exert a marked and unlooked-for change, either for better or for worse, in the condition of an aneurism, and his conclusion is that the matter is still *sub judice*.

At the same meeting of the Society there was read a paper by Mr. HENRY MORRIS, M.A., F.R.C.S., of the Middlesex Hospital, on *A Case of Aneurism of the Arch of the Aorta involving the Innominate Artery; with Remarks on the Distal Ligature*. This case presents many peculiarities. After continued treatment with rest and acetate of lead, it was deemed expedient to tie the carotid, but upon attempting to do so it could not be found, and the pulsating internal jugular was ligated, after it had been wounded in the search for the artery. After death, which occurred on the fourteenth day, the aneurism was found to involve the aortic arch,

as well as the innominate. The common carotid, entirely impervious, was found covered by much condensed cellular tissue, having evidently undergone occlusion some time previously. This closure of the carotid began one and three-eighths of an inch from its origin, was complete for one-eighth of an inch, and could only be accounted for by the pressure of the aneurism. Mr. Morris directs attention to the bearing of the case upon the diagnosis of aortic aneurism from aneurism of the innominate. After a very careful examination by several surgeons no one questioned that the disease was of the innominate, and yet upon thorough dissection the true condition of affairs was found to be a sacculated aneurism, communicating with the aorta by an opening one and three-quarters of an inch in circumference. This opening impinged upon the orifice of the innominate, the lower end of the right wall of that vessel being deficient, and presenting a crescentic, rounded, thickened edge.

Mr. Morris discusses the application of the distal ligature, and is of the opinion that the revival of the operation has not been attended with encouraging results, when either the aorta or the innominate has been the seat of disease, but he thinks the same measure is a much more hopeful one upon the left side. There are several other points of interest in this case on which we cannot now dilate, but we cannot leave the paper without commenting upon the honest and fearless way in which it has been reported.

In the sixty-third volume of these "Transactions" Messrs. Alfred Willett and W. J. Walsham, both of St. Bartholomew's Hospital, reported a case of malformation of the bony thorax observed in the body of a woman. In this volume they report *A Second Case of Malformation of the Left Shoulder Girdle*, occurring under Mr. Willett's care, in the person of a girl eight years old. The deformity consisted of a triangular bridge of bone stretching between the spine and scapula. The base of the process was connected with the scapula by cartilage, permitting a hinge-like movement, and the truncated apex was attached by osseous tissue to the seventh cervical and first dorsal spinous processes. The reporters of the case regard the bridge of bone as an abnormal development of the supra-scapular epiphysis, homologous to the supra-scapular bone possessed by some of the lower vertebrata. The question is argued at some length, and two lithographs are given. It is certainly a curious illustration of the oft-noticed occurrence of rare cases near together, that so very unusual a deformity should be observed twice within so short a time by the same surgeons.

Mr. Herbert W. Page contributes an interesting paper, entitled *Subperiosteal Hemorrhage (probably scorbutic) of Three Long Bones in a Rickety Infant*. It is very closely allied to the article immediately preceding it by Dr. Barlow, which is noticed by our medical colleague. A child nine months old, brought up entirely on Savory's and Swiss milk food, was found to have large extravasations of blood beneath the periosteum of one femur, and both tibiæ. There was well-marked rickets. Mr. Page made incisions in both thigh and leg, and washed out by syringing the disorganized blood-clots, with the effect of immensely relieving the patient. Regarding the case as scorbutic, an entire change of diet was made, and the result was most happy. There was no periosteal inflammation, nor any necrosis of bone, and in view of the large use made of these manufactured foods, the case, especially when taken in connection with the article by Dr. Barlow, is most suggestive.

The next surgical paper is by ARTHUR E. J. BARKER, Assistant Surgeon to University College Hospital, on *Cavernous Nævus of the Rectum proving Fatal in an Adult from Hemorrhage.*

There was some difference of opinion concerning the nature of the disease. Mr. Marshall thought it might be ulceration of the sigmoid flexure of the colon, while the reporter suspected that the ulcers he saw surrounded by a purplish background indicated nævoid disease. This suspicion was strengthened by the fact that from childhood the patient, at the time of observation a man of forty-five, had been subject to occasional attacks of bleeding. Astringent injections were ordered with but little effect. The hemorrhage was continuous, and the patient very soon died, rather suddenly, from exhaustion. The post-mortem examination revealed the development of considerable nævoid tissue in the rectal wall, with two ulcers from which the hemorrhage had come. Inasmuch as the ulcers from which the bleeding came were not more than two and a quarter inches from the verge of the anus, it would seem as if something might have been done, either by ligature or the actual cautery, to arrest the fatal flow, for a time at least.

Sir SPENCER WELLS, Bart., narrates *A Case of Excision of an Enlarged Cancerous Kidney*, in which death occurred on the fifth day after the operation. The operation was not difficult, although delayed by the application of several ligatures to vessels in the abdominal wall, and in the capsule of the kidney. The patient was a gentleman 58 years of age, who had suffered from renal hemorrhage for some eighteen months. The enlarged kidney had been diagnosed for about the same length of time. Blood appeared in the urine frequently after the operation, which, owing to the refusal to permit an autopsy, the reporter is unable to account for, as there was no indication of disease existing in the other kidney, nor in the bladder. The cause of death was obscure, as there was but little evidence of peritonitis. Should Sir Spencer Wells again remove a kidney, he will apply some stitches to bring together the edges of the peritoneum covering the organ, as he thinks that measure may prevent the escape of blood and serum into the abdominal cavity.

A brief but interesting paper is one by Mr. JOHN MARSHALL, F.R.S., Professor of Surgery in University College, in which he narrates *A Case of Suppurating Traumatic Hæmatoma connected with the Left Kidney, treated by Puncture and Antiseptic Drainage.* The case was that of a girl, thirteen years old, who had been run over nine months previously. There was no hæmaturia, but a large fluctuating tumour filling up the left abdomen. After a preliminary aspiration, a large trocar and canula was inserted, and thirty-six ounces of a chocolate-coloured fluid removed. A drainage tube was introduced through the canula. Antiseptic precautions were used. There was a large amount of consecutive discharge, with a slow but satisfactory recovery. Both when the aspirator was used and subsequently at one of the dressings, there was evidence of the presence of urine, and Mr. Marshall thinks there was probably either a superficial laceration of the kidney or a subcapsular hemorrhage.

Twelve Cases of Tumour of the Bladder (10 *in the male and* 2 *in the female*), *in all of which an Operation has been Performed for the Removal of the Growth, with their Histories and Results*, is the lengthy title of the concluding surgical paper of the volume. In it Sir HENRY THOMPSON sums up the results of his cystotomies to the time at which the paper was presented, May 5, 1883. During the year since past, Sir Henry Thomp-

son has repeated the operation on numerous occasions. In the *Medical News*, Jan. 5, 1884, he says that he has explored the bladder thirty-two times, and in that number are included fifteen instances of tumours. Already he has followers, and the operation would seem to be destined to take its place as a recognized surgical procedure. In the paper in this volume the case is put very plainly. "Vesical tumour is *inevitably fatal. Every recovery is a clear gain; and a fatal issue is simply the natural termination forestalled.*" Of the twelve cases reported in the paper, five have recovered, and there is good reason to hope that the cure will be permanent. In three cases death followed the operation in a few days. In one it occurred in a few weeks. In the other three, benefit has resulted, but not cure, and the promise is made that their ultimate result shall be carefully watched and published. Eight of the tumours were papillomata, three were more or less malignant, and one closely resembled the submucous tissues of the bladder without villous growth. The duration of papilloma as shown by these cases is slow, from three to seven years, while that of the malignant cases was from one to two and a quarter years. Attention is directed to the important distinction that papilloma is generally first manifested by bleeding, while malignant disease has very often been foreshadowed by painful micturition. Too much attention cannot be paid to the microscopic examination of the urine, which should be again and again repeated. One very instructive case is mentioned in which upon the first examination a typical specimen of villous growth was found, and although no such specimen was again obtained, exploration of the bladder was made, and a well-marked papilloma removed. In other cases only fusiform cells, which are not pathognomonic, were found. In two such cases, in which the rational symptoms were well developed, upon opening the bladder no tumour was found, but both cases were much benefited by the operation. Sir Henry Thompson is convinced that where a villous growth is nearly all removed there is little cause to fear its return, the remnants being obliterated by the cicatricial processes. A critical survey of the specimens contained in the different London museums convinces him that in about sixty per cent. the tumours are innocent, in forty malignant, and he feels confident that in at least one-half of the innocent growths, which, be it remembered, inevitably lead to death, removal can be accomplished, and a cure effected. The paper contains a tabular view of the cases, and an appendix giving an account of the microscopical appearances of the growths removed.

In closing this notice, it would not be right to omit saying that the surgical papers in the volume are of exceptional value and interest.

S. A.

Of the papers which are especially of medical interest, the first is the late Dr. VASY LYLE'S contribution on the *Endemic Hæmaturia of the Southeast Coast of Africa*, which is presented with a short introductory note by Dr. JOHN HARLEY. This disease, associated with the presence of the ova of the *Bilharzia hæmatobium* in the urine, ascertained by Bilharz and Griesinger to prevail among the people of the valley of the Lower Nile, has been shown by Harley to exist also among the Zulus and the people of Natal. Dr. Lyle made a series of exhaustive researches into the etiology of the disease, and these notes are the result. Of the widespread extent of the disease he says: "The *B. hæmatobium* infests the whole eastern littoral of Africa from Egypt to the Cape, and the entozoon found amongst the people of the Nile Valley is identical with that

found in South Africa." We have not space to go into the evidence which brought Dr. Lyle to this conclusion; it is sufficient to say that it is the outcome of a correspondence, covering some years, with physicians in various parts of the continent of Africa. The entozoon is thus described, the specimen being found in the bladder of a patient who had suffered from the endemic hæmaturia:—

"A black line was observed and dissected out. It proved to be a *female* Bilharzia. It was one inch long and filiform. Ova were contained in the hinder part of the body, and these were granular; the pointed end was not always in one direction, but generally opposite the outlet; they were arranged mostly in single file. The intestine divides into four gradually diminishing canals, which soon reunite to form a broad, central sacculated tube, which extends down to the middle of the body, and terminates in a *cul-de-sac*. The characteristic spine of the egg was always terminal."

The posterior fragment of a *male* specimen was afterwards obtained, and examination showed the following characteristics:—

"The body was roughly tuberculated, and tapered to a conical tail, reminding one of the crocodile. The alimentary canal presented anastomoses, and the gynæphoric canal was continued to the tail."

The introduction of the entozoon into the body is not accompanied by any characteristic symptoms, the earliest indication of its presence being when the worm is sufficiently mature to shed fertilized ova, and at this time the patient begins to pass urine, the last few drops of which are mixed with blood, and which, upon microscopic examination, reveals the presence of many fertilized ova, whose detection in these cases gives certainty to the diagnosis. There is little or no general distress; occasionally only is there a dull, aching sensation in the lumbar or perineal regions.

"But sometimes the bleeding goes on increasing until the quantity of blood lost at each act of micturition is considerable, and voided not only mixed with the urine, but in clots. Now the perineal distress and lumbar pain become marked, and a true vesical catarrh occasionally sets in, a complication not easily cured, as its cause is to a great extent beyond the reach of our remedies. Grave as this picture is, I must, however, state that I have not yet met with a fatal case of *B. hæmatobium*, whether arising directly or indirectly from the presence of the entozoon."

Three characteristic cases are cited, and the author then proceeds to an investigation of the causes of the disease, and especially as to the manner in which the parasite is introduced into the body. His researches bring him indubitably to the conclusion that, whilst we know nothing of certainty as to the mediation of other agents, the water from certain sluggish streams flowing through swampy valleys in certain localities played an important part in the dissemination of the disease, and that when nothing but rain-water was used for washing, cooking, or drinking immunity was secured.

It is greatly to be regretted that the death of the accomplished author has left us only the imperfect yet valuable notes which are contributed by his literary executor, but the subject rests in the competent hands of Dr. Harley, from whom something further may be expected.

Dr. KIDD'S *Contribution to the Pathology of Diphtheritic Paralysis* is the history of a single case, illustrated by a handsome cut, and accompanied by copious notes. The rather limited literature of the pathological

anatomy of the disease is thoroughly reviewed. The case which is reported was one of but two months' standing, in a boy seven years of age, in whom there was found to be complete paralysis of the palatine muscles, as well as of the intercostal muscles. He died shortly after he was first examined, and the autopsy was made twenty hours after death. The capillaries of the brain, spinal cord, and membranes were found to be uniformly the seat of an accumulation of leucocytes, and in a few instances the small veins were seen to be crammed with red corpuscles, especially in the pons and medulla. "The changes presented by the anterior cornua consisted in atrophy and alterations in the shape and appearance of their nerve-cells. . . . Side by side, with large, sharply-outlined, multipolar nerve-cells with branching processes, are seen small, indistinct cells which have lost their processes. These cells have also a tendency to assume a more or less globular form in some instances; in other cases they are irregularly shaped." The cell protoplasm was pale and indistinct, vacuoles were to be found in some, and the nucleus was generally invisible, excepting in the globular cells, which were more than normally granular, and in which the nucleus is strongly marked.

"The affection of the motor cells was found in almost every section from the dorsal region, and was not confined to any particular cell-group of the anterior horns. The nerve-cells of the tractus intermedio-lateralis are unaffected in the dorsal region, though in the cervical segment similar but less marked alterations than those above described are seen in the cells of this group also. The anterior nerve-cells of the cervical cord show exactly similar changes, but a relatively smaller number of cells is seen to be affected."

In the lumbar region the motor cells were almost all quite healthy, and no change was visible in the nerve-cells of the pons and medulla, or in nerve-nuclei on the floor of the fourth ventricle. The author assumes that the microscopic evidence is distinctly in favour of a diagnosis of a "polio-myelitis anterior," a distinct degenerative affection of the motor nerve-cells in special regions, characterized by a somewhat irregular distribution.

Dr. BARLOW presents a paper on *Cases described as "Acute Rickets," which are probably a combination of Scurvy and Rickets, the Scurvy being an Essential and the Rickets a Variable Element.* This paper he divides into four sections: (1) The narration of a typical case; (2) an analysis of principal symptoms in the recorded cases, and the cases which have come under his personal observation; (3) the results of post-mortem examinations; and (4) a discussion of the etiology and affinities of the disease. To these are added the bibliography of the subject, and an excellent table of thirty-one cases, which in itself is a complete history of each patient. The typical case, which is carefully reported, had a favourable termination, having been seen early and put upon a course of treatment adapted to meet the requirements of the double lesion. A complete change was made in the diet, which was made to consist of the juice of a quarter of a pound of raw beef sweetened a little, a pint and a half of cow's milk daily, "to which was to be added in his alternate meals at one time a third part of strained gruel, at another a third part of barley-water, and finally two teaspoonfuls of orange juice were to be given daily." Abundance of fresh air and attention to personal hygiene completed the treatment, and in three days improvement was noted. Wet compresses which had been applied to the swollen limbs were a source of great relief; these were changed every two hours, and

in the three days a marked diminution in the tenseness and tenderness was apparent. Under this treatment the improvement was progressive, and within eight weeks the child "would get on his knees and could stand with a little support; he was of a ruddy colour, and his skin and muscles had become quite firm."

The post-mortem appearances are given in three of the fatal cases; in one the bone lesions were especially interesting:—

"On making an incision down to the shaft of the femur, the periosteum was found separated from the shaft entirely in a continuous sheet. It was about ¼ inch thick, and was intensely injected all over the inner surface. The shaft of the femur was separated from the epiphyses, and was almost entirely surrounded by a layer of maroon-coloured blood clot, one-quarter to one-half inch thick, which loosely adhered to it, and in fact separated the shaft completely from the periosteum. On removing a little of this clot, the surface of the shaft of the femur was seen to be perfectly smooth. The ends of the shaft were not splintered, but had a 'sugary' surface. . . . The changes round the tibia were not so extensive as round the femur, but they were of the same character. The periosteum was thickened, vascular, and separated from the upper and lower thirds of the shaft by a thin layer of blood. In the middle third there was no blood; the periosteum was adherent to the bone, but easily stripped up. The shaft did not, as the femur, lie absolutely separated from the epiphyses, but was loosened at the upper end."

The microscopic appearance of these sub-periosteal hemorrhages is very well shown by an excellent coloured plate which is appended to Dr. Barlow's paper. With regard to the cause of the hemorrhage Dr. Barlow considers it an open question: whether it is dependent upon damaged nutrition of capillaries, altered blood state, or both. He concludes:—

"To sum up this paper, I will submit that (1) the characteristic symptoms of the so-called acute rickets, viz., the special limb affection and the cachexia, with or without sponginess of gums, are not due to rickets at all, but are truly scorbutic; (2) that the anatomical basis of the limb affection is sub-periosteal hemorrhage, and that this hemorrhage probably accounts for some of the anæmia; (3) that the disease may occur in rickety children, and perhaps in them more readily than in non-rickety children, but that the amount of rickets may be almost nil; (4) that although the disease tends spontaneously in many cases towards a slow but complete recovery, marked improvement often follows a vigorous and especially an early antiscorbutic treatment; (5) that the treatment recommended is—*locally*, during the acute stage wet compresses and avoidance of movement, at a later period careful shampooing and douches; *internally*, the use of raw meat-juice, fresh milk, and orange juice, or of some other fresh raw vegetable, and from the first the access of as much free air as is possible; (6) that the use of the term acute rickets should be abolished for these cases, and that of infantile scurvy substituted, the special note of which, as distinguished from adult scurvy being the greater incidence of the disease on the bones; (7) that in regard to the hand-feeding of infants it seems probable that the so-called 'infant foods' cannot be trusted as sole aliment for any lengthened period, however useful they may be as adjuncts."

A bibliography, and a table of thirty one cases, are added to this very instructive and valuable paper.

Dr. WEST presents a paper in two sections: I. *A Case of Purulent Pericarditis treated by Paracentesis and by Free Incision, with Recovery*; and II. *The Statistics of Paracentesis Pericardii, with Remarks.* The patient was a lad sixeen years of age, who two months before his attack was struck by a truck in the back. When admitted to the hospital he presented the following physical signs:—

"He was deeply cyanosed. The respirations were 28, and laboured. The pulse was 78 at the wrist, markedly paradox, *i. e.*, intermitting with each inspiration, and losing thus two or three beats with each intermission. The heart was beating regularly at about 120 a minute. The præcordial region was bulging and slightly œdematous, and the epigastrium looked full. The apex beat was not visible, nor could it be felt. There was an indistinct heaving felt over the whole præcordium, and impulses could be faintly felt in the third, fourth, and fifth spaces midway between the left nipple and the sternum. Dulness extended in the fifth intercostal space from close to the right nipple line to nearly three inches outside the left nipple line. The area of dulness was somewhat conical in shape, and reached upwards to the middle of the second intercostal space near the sternum.

"The cardiac sounds were almost entirely inaudible, except just where impulse was faintly felt. All round the limits of this area of dulness fine crackling crepitation (pleuritic) was heard, which extended also into the left axilla, but the lungs elsewhere were not affected, and the bases behind were perfectly natural."

Without going into the details of the progress of the case, it is sufficient to say that, seven days after admission, the operation of paracentesis pericardii was performed, puncture being made with a small trocar and canula in the fourth intercostal space almost immediately below the nipple. Thirteen ounces of laudable pus were obtained. The cavity was then washed out with a one per cent. solution of carbolic acid. Relief was almost immediate, and the patient passed several days of comparative comfort. Four days afterwards there were evidences that the cavity was filling again, and another resort was had to paracentesis; this time five or six ounces of pus were obtained, but with so much difficulty, that a free opening was made with the result of a copious evacuation of pus "estimated at at least two quarts." A large drainage tube ($\frac{1}{2}$ in. diam.) was inserted and carbolized dressing applied. The patient made a good and rapid recovery, the incision being entirely closed in thirty days.

A remarkable case is also reported in which diagnosis was made during life of a mediastinal cyst, and in which paracentesis was several times performed with great relief, but which proved on post-mortem examination to be a case not of mediastinal cyst, but of chronic pericardial effusion. Note is also made of one other case in which there was associated the pulsus paradoxus.

In the second section of the paper Dr. West discusses the statistics of paracentesis of the pericardium, and appends a valuable table of eighty cases, bringing the notes of cases down to the year 1883, and including one case then unpublished.

Dr. Angel Money, in his paper on *Gliomatous Enlargement of the Pons Varolii in Children*, adds two cases to the two already published in the *St. Bartholomew's Hospital Reports*. Autopsies were obtained in both cases, which confirmed the diagnosis. In both there was enormous expansion of the pons Varolii and crura cerebri. In the first case the "bridge" measured 2 inches from side to side, $1\frac{3}{8}$ inches from before back, or about half as much again as natural for that age (eleven years). In the second case the greatest width was $2\frac{1}{4}$ inches, the greatest length $1\frac{1}{2}$ inches, and the greatest thickness $1\frac{1}{4}$ inches. This child was six years of age. The most obvious change, on microscopic examination, was small-cell infiltration; "sections from the thick part of the tumour consist of very little else than cells. The shape of these units is various, they are mostly round or oval, sometimes reniform." A handsome coloured plate

is added to the paper illustrating the macroscopic appearances of the brain in the first case.

Mr. SHARKEY reports a *Case of Asymmetry of the Brain, presenting Peculiarities which Bear upon the Question of the Connection between the Optic Nerves and Certain Definite Areæ of the Cerebral Cortex.* The patient was a female, aged 25, and the condition was "evidently a congenital abnormality, and was accompanied by a certain diminution in size of the right arm and leg, and by rigidity of the former." Death was due to traumatic causes. The following were the most striking characteristics of the specimen: (1) A general arrest of development of the left hemisphere. (2) The small size of the corresponding crus cerebri and anterior pyramid. (3) The absence of the angular gyrus and superior temporo-sphenoidal convolution, together with the fusion of some of the other convolutions of the left temporo-sphenoidal lobe. (4) The small size of the optic tract, optic thalamus, and corpora geniculata on the same side. Two excellent plates accompany Mr. Sharkey's paper.

Dr. THIN contributes a short paper *On the Bacillus of Leprosy*, in which he gives the results of microscopic examination of leprous tissue from three cases, and adds to his paper two good plates of the microscopic appearances.

Mr. FOX presents a short article *On Urticaria Pigmentosa, or Xanthelasmoidea*, with a tabular summary of nineteen cases of the disease, drawn from all sources.

It is somewhat unusual to find a volume of transactions in which the papers are so uniformly instructive and readable as are those in the one before us. The subjects are varied, and are carefully and thoroughly treated, with full references to their literature, and, when desirable, illustrated by admirable plates. Taking it all in all, this volume forms a very valuable contribution to medical literature. R. P. R.

ART. XXII.—*Le Piu Recenti Modificazioni del Taglio Cesareo, studio storico-critico* del Dottor LUIGI MANGIAGALLI, Professore di Ostetricia nella Regia Universita di Sassari.

The More Recent Modifications of the Cæsarean Section. A Critico-Historical Study. By Dr. LUIGI MANGIAGALLI, Professor of Obstetrics in the Royal University of Sassari, Island of Sardinia, Italy. 8vo. pp. 210. Milan: Pietro Agnelli, 1884. (From Annali di Ostetricia, Anno vi. and vii. 1882–4.)

OF the younger gynæcologists of Italy, perhaps no one has been more devoted to literary work in the last decade than the author of the monograph under view. Being a good linguist; having visited many of the most celebrated hospitals of Europe, with a view to improving the construction of those in Italy; an earnest statistical investigator in obstetrical and gynæcological questions; and a former member of the staff of Santa Caterina Obstetrical Hospital and School of Milan, where in 1879 and 1880 he twice performed the Porro operation, with success to mother and child, Prof. Mangiagalli is eminently fitted for preparing the historical paper above named. We only regret that the post assigned him after

running the *concorso* in 1882 has for a time confined him to the narrow limits of an island, and thus diminished his facilities for literary work. But, notwithstanding this obstacle, he has twice prepared extensive papers upon the Porro operation since he obtained his professorship, and this second one before us has not only abstract reports of 140 operations, but gives a history of the experiments, which step by step after 107 years bore fruit in its entire success in the case of a parturient woman. To this portion of the volume he has added a record of the cases of laparo-elytrotomy, with the early history of this form of delivery and its modifications, and an account of the many changes which have been made, with a view to greater safety, in the manner of performing the old Cæsarean operation, by Lebas, Polin, Barnes, Spencer Wells, Cohnstein, Frank, Kehrer, and Sänger, as well as minor modifications by others.

In the early days of the Cæsarean operation, which, as far as can be ascertained, was first performed upon the living woman less than four hundred years ago, unless it may have been earlier self-inflicted, which to judge from more recent cases is quite probable, operators confined their attention to the location and direction of the abdominal incision, the proper way and place of opening the uterus, and the method of closing the abdominal wound. No one appears to have thought it requisite to sew up that of the uterus, until Lebas did so in 1769, and again with success upon the same woman in 1771. This improvement appears to have been for a long period lost sight of until repeated in 1828 and 1852 in the United States, the latter operation having been successful. This operation, by the late Dr. Frank E. Polin, of Kentucky, was the first in which silver wire was used, and the fact that he performed it was known to but few physicians, until the record of the case was obtained from his notes in October, 1880. The value of silver wire was, however, demonstrated and made known in 1867, when Dr. Brickell of New Orleans, La., operated upon and saved a patient after a prolonged labour. This operator did not know of the Polin case, nor was he aware of the fact that Dr. Townsend of New Haven, Conn., had sutured a uterus with success thirty-six days earlier, using fine hemp as the material. With these two cases reported in 1868, we may date the revival and establishment of the use of the uterine suture. With this revival came experiments in material; and silk, thread, horsehair, animal fibre from skins, tendons, peritoneal membrane, etc., were made use of. Caoutchouc was also employed because of its elasticity; and finally pure silk, which it is claimed disappears in time by absorption, became, and is perhaps now the favourite. The antiseptic method of Lister has in a measure revolutionized the minor details of the operation, and carbolized ligatures, washings, and dressings are undergoing a trial, Finally, the failure in Germany of the Porro-Cæsarean improvement, in materially diminishing the mortality of the old method, has directed the attention of gynæcologists to the latter, who are endeavouring to devise some means by which the uterine wound may be kept from gaping, made impervious to fluids, and its early healing secured.

It may be of interest here to state that silver-wire has been used in the United States in suturing the uterus in 12 Cæsarean cases, with 6 recoveries; silk in 10, with 3 recoveries; fine hemp in one, case saved; carbolized catgut in one, case lost; and some material not named (one suture), case lost. Of these 25 operations, 6 were early and 19 late; 3 early and 12 late operations were fatal. The statistics of the United States

show that but two cases out of nine were operated upon in good season, or 28 out of 126. Of these 28, there were no sutures used in closing the uterus in 22, and of these, 18 recovered. We may possibly diminish our mortality in *early elective cases* by some improved uterine suture, but the observations of the reviewer lead him to believe that *reform in the period of operating will accomplish much more than changes in the detail.*

As all the forms of operation comprised by the term *gastro-elytrotomy*, as well as the improved method of Prof. T. Gaillard Thomas, entitled by him *Laparo-elytrotomy*, have a chronological precedence over the Porro operation, the reviewer takes the liberty of considering the latter in its proper chronological order.

Gastro- or Laparo-elytrotomy.—The author gives 18 pages to the consideration of this substitute for the old Cæsarean section, and presents short abstracts of the cases of Ritgen, Baudelocque, Thomas, Skene, Hime, Edis, and Gillette. Claims for originating the method have been made in favour of Jœrg (1806), Ritgen (1820), Baudelocque (1823), Physick (1824), Sir Charles Bell (1837), and Thomas (1870). Jœrg never operated, and probably would have failed if he had. By his plan the abdomen was to be opened; and the vagina; and possibly the cervix split up: all of which was to avoid opening the body of the uterus. The method of Ritgen was a true laparo-elytrotomy, devised by him after having heard of the extra-peritoneal method of ligating the external iliac artery. He operated in 1821, but was forced by hemorrhage from the vaginal incision to deliver by the old Cæsarean operation. The child was alive, but the woman died of vaginal and uterine hemorrhage. To Ritgen is generally given the credit of originating the operation, although he failed in its performance. Baudelocque proposed no less than six ways of operating, and tried his skill upon two patients, both of whom died. In case one, the vaginal hemorrhage forced him to abandon his scheme and deliver by gastro-hysterotomy. The patient died as in the Ritgen case. In case two, Baudelocque determined to avoid the risk of hemorrhage, and to accomplish this, prepared to tie the internal iliac artery, but, pricking it accidentally, was forced to tie the primitive iliac. He then delivered the woman of a dead fœtus. She died in 76 hours, probably of septic peritonitis. Physick's operation did him no credit as an anatomist, as his plan was a central one, and he proposed to reach the vagina over the top of the bladder; fortunately it was never attempted. The originality of Sir Charles Bell's proposition is very much doubted, as he had the means of learning about the work of his predecessors. The plan of digital laceration of the vagina was, however, original with him.

To T. G. Thomas is due the credit of having originated *de novo*, after an interval of twenty-seven years (from his anatomical knowledge and trials upon the cadaver), the method of Rigen, adding Bell's all-important change of opening the vagina by laceration instead of incision, except in the incipiency of the elytrotomy, which was by puncture. As this method of starting the vaginal opening is sometimes quite dangerous, Dr. Garrigues proposes to open the vagina by the thermo-cautery, or other form of cautery, so as to avoid all hemorrhage, and then enlarge the opening by forced laceration of the vagina. Since the revival of this operation by Thomas, there have been 8 women subjected to it by five operators, with 4 women and 5 children saved. The last operation was in November, 1879, since which time the Porro operation has been performed more than a hundred times.

The Porro-Cæsarean Section.—Dr. Mangiagalli has arranged in chronological order, with a few exceptions, a set of abstract records of 140 Porro, and so-called Porro cases, covering 84 pages of his monograph. These cases require to be classified, so as to show the mortality of the operations properly called Porro, as compared with those improperly called by his name. In the paper of Dr. Godson, of London, reviewed in the last number of this Journal, he excludes from the true Porro list, cases 45, 57, 64, and 81 of Mangiagalli, and adds two by Kehrer and Fehling, not in his record, making 138 cases. Nos. 45 and 57 were cases of uterus bicornis, from which one cornu and one ovary were removed. No. 64 was operated upon at a non-viable period of fœtal life; and No. 81 was a removal of a uterus under an error in diagnosis. Case 57 recovered, and the other three died. Prof. Mangiagalli also gives a list, on page 119, of the operations in his record, in which the cervix uteri was dropped in after amputation, in all 15, with 4 saved. From this we exclude his cases 15, 57, and 81, and add the third operation of Heusner No. 54, which he has overlooked. In Case 15, the pedicle was not dropped in, as the operator has stated to Dr. Godson. The reviewer well remembers this case, as he and several writers fell into the same error, from an ambiguity in the original report. Therefore Veit, and not Litzmann, was the first to try this unfortunate experiment. In Case 57, the cervix was not amputated, but the one-half of a *uterus duplex*, five months after full term; hence the recovery of the woman. In Litzmann's similar case the pedicle was secured by pins in the abdominal wound. Correctly, then, the cervical stump has been dropped in 13 times, in *quasi* Porro cases, with 10 deaths.

The question having been asked the reviewer within a few days, "What is the present status of the Porro operation?" we will answer it as far as is possible from the reports of cases collected up to last November.

True Porro cases 122. This excludes operations on 3 moribund cases, performed in the interest of the fœtus, and 13 Veit experiments in dropping in the pedicle. Of the 122 cases, 82 are recorded as "*favourable*," "*fair*," or "*not very unfavourable.*" Of these, 47 recovered and 35 died. Forty cases are recorded as "*unfavourable*," "*very unfavourable*," "*deplorable*," "*exhausted by previous disease*," "*exhausted by previous attempts at delivery*," etc. Of these, 12 recovered and 28 died. This gives $57\frac{3}{4}\frac{3}{1}$ per cent. of recoveries out of the favourable class of cases, and 30 per cent. of the unfavourable. Of all the cases properly to be named Porro or Porro-Müller operations, *i. e.*, 122, there have been 59 recoveries, or $43\frac{4}{8}\frac{4}{1}$ per cent. Under the old Cæsarean operation in the United States, including moribund cases and all, the percentage saved has been $41\frac{7}{8}\frac{7}{3}$. No less than 153 operations of different kinds, many of them far removed from the original of Prof. Porro, have been called by his name. Of these, 65 ended in recovery, and 88 in death. It is only by contrasting the results of the Porro operation with those of the old Cæsarean section in the same European maternity that we can learn to appreciate the very decided advantages of the former in saving life.

Revival of the Old Cæsarean Operation.—The Porro operation having only saved a fraction over thirty per cent. of women in Germany, there has been an effort made to return to the old method, and to devise improved plans of operating, so as to lower the rate of mortality. Attention has been drawn to the proposed processes by the author, who reports several cases in abstract, and gives the special peculiarities of each method. These are known as the Cohnstein, Frank, Kehrer, and Sänger processes.

Cohnstein's Process.—Open the abdomen by long vertical incision; turn out the uterus entire; make pressure on the aorta to check the loss of blood during the opening, evacuating and contracting of the uterus; open the posterior wall of the uterus vertically; remove the fœtus and secundines; replace the organ, and, when contracted, pass a drainage-tube through the Douglas *cul-de-sac* and vagina, and close the abdominal wound. Cohnstein proposes the posterior uterine incision, because the posterior wall is thicker and more muscular, and he anticipates a better and more permanent closure of the wound, a more direct drainage from position and a support to the opened portion by the weight of the uterus resting on it. The operation, as far as known to the reviewer, is still one of theory only.

Frank's Process.—Wash the abdomen with ether and with a five per cent. solution of carbolic acid; disinfect the vagina by irrigating with the latter fluid. Turn out the uterus entire, and incise it vertically, commencing low down in the vesico-uterine excavation; extract the fœtus and secundines; wash the front of the uterus, its interior, and the vagina with a five per cent. carbolic-acid solution. Pass a large drainage-tube through the abdominal and uterine wounds and out through the vagina. Suture the uterus above the tube with strong catgut. Draw the round ligaments together above the uterine wound, and secure them with sutures of Czerny silk, so as to close over and separate from the abdominal cavity the vesico-uterine pouch, which is to be drained by three tubes—"one utero-vaginal, one pre-uterine, and a third applied along the uterine wound to the top of the pavilion." This operation has been once performed in the interest of the fœtus, the woman having been so badly burned that she died in ten hours. The child was saved, although it had a pulse of 150 before the operation.

Process of Kehrer.—Open the abdomen through the linea alba. Incise the uterus transversely between the insertions of the round ligaments. Extract the fœtus and secundines. Close the muscular layer of the uterus by from six to ten deep-seated stitches of carbolized silk, and the peritoneal portion by from twelve to twenty-five. Use Listerism in the operation and dressings, abdominal drainage, and vaginal irrigation. Two operations have been performed after this method, both in cases of 4-parous malacosteon subjects, aged respectively 26 and 30—the first on September 15th, and the second on November 13th, 1881. In the first patient six and twelve points of suture were used, and in the second, ten and twenty-five. The first recovered in thirty-five days; and the second died in twenty-eight and one-half hours. At the autopsy of the second, the margins of the wound in the uterus were found adherent, except at one point, where a triangular space was left uncovered by the peritoneum; over half a pint of sero-sanguinolent fluid was found in the abdominal cavity.

Process of Sänger.—In an octavo monograph of 200 pages, published in Leipzig in 1882, and kindly sent to the reviewer, we find an illustrated description by Dr. Sänger of his proposed method of improving the uterine suture. This paper was completed in December, 1881, since which time the process has been tried in two cases, viz., by Dr. Leopold, on May 25th, 1882, case saved; and by Dr. Beumer, on September 11th, 1882, case lost. The plan of operation is as follows: Abdominal incision to be made as usual; two strong ligatures are to be inserted through the margins of the wound near its upper angle, to be drawn upon after turning

out the uterus. Membranes to be ruptured through the vagina. If practicable, the uterus is to be lifted out and held vertically. A sheet of caoutchouc, moistened with a 5 per. cent. solution of carbolic acid, is to be made to inclose the cervix and cover the abdomen, to protect its cavity against the entrance of fluid. The ligatures are to be drawn upon to close the abdominal wound, while the uterus is incised vertically in front, and the fœtus removed. If the organ is incised *in situ*, manual compression is to be made as a hæmostatic upon its lower segment; if opened after being turned out, manual compression; the application of clamps to the broad ligaments, or of an elastic tube to the cervico-uterine cone. After evacuating the uterus, any hemorrhage from the wound is to be checked by hæmostatic pincettes. When the uterus has well contracted, pass a utero-vaginal drainage tube, and introduce a carbolized sponge into the uterine cavity. Dissect the peritoneum free from the muscular edges of the uterine wound, and pare from the latter on each side a long slice of tissue of a wedge-shape, the thick edge being next to the peritoneal side, and the thin edge to the uterine cavity. The free edges of the peritoneum are now to be turned in over the muscular layer, and deep-seated stitches of silver wire or silk inserted, so as to penetrate the peritoneum and pass nearly through the muscular coat. Then superficial stitches at short intervals are to be passed, so as to secure the turned-in peritoneum and keep its serous surfaces in contact, making a secure welt.

1. *Leopold's Sänger operation* was performed upon a 2-para deformed by rickets, 29 years old; and commenced as soon as the bag of waters had well descended. The operation lasted an hour. Woman and child saved; the former well in three weeks.

2. *Beumer's operation* was performed upon a 6-para of 41 years of age, having a fibromyoma of the posterior parietes of the cervix, and affected with cystitis and suppurative pyelo-nephritis. She was in labour a few hours, some eight or ten. Symptoms of collapse shown before conclusion of operation; died in forty hours. The autopsy revealed "hypostatic pneumonia of lower and middle lobes of right lung; œdema of both lungs; excessive pyelo-nephritis, with destruction of a great part of both kidneys; incipient peritonitis, and an intramural fibroma, as large as a child's head, of the posterior cervical parietes, fixed in the Douglas space by old adhesions." The sutures had held the parts securely. It is evident that the fatality of the case was due to the previous bad health of the subject. The child was living.

Although for many years, after numerous experimental trials, Cæsarean operators appeared to have settled in the belief that the abdominal and uterine incisions should be in the median line, vertical and superimposed, this question of preference in the point of incision, at least as far as the uterus is concerned, has been recently reopened, as shown in the accounts of new methods just given. A careful study of the venous anatomy of the impregnated uterus, and the lines of direction of its muscular fibres, will show why it is usual, in operating, to select the body of the uterus and to incise it vertically in front. Primary hemorrhage is rarely a direct cause of death in Cæsarean operations, but may be indirectly fatal, by adding to the shock and exhaustion, and favouring the absorption of septic matters. The chief factor in severe primary hemorrhage is cutting down upon the placenta. This, it has been claimed, may be avoided by the diagnostic test of Prof. T. Halbertsma, of Utrecht, who punctures the

uterus in the locality of the incision with a hypodermic needle, to find whether amniotic fluid or blood will be drawn off by it. Should the placenta be found beneath the line to be incised, it has been proposed to cut the uterus transversely beneath its edge, so as to avoid it, or to turn out the organ and cut it open behind. In Godson's Porro operation, which was in a case bearing the placenta in front, the uterus was torn across, to prevent hemorrhage and to avoid the placenta; but this form of opening might not heal rapidly in a case of gastro-hysterotomy.[1] Manual constriction of the cervix has been successful in preventing loss of blood, as in the Broomall Cæsarean section; and the wire constrictor, after uterine avulsion in the Müller's operation, has resulted in the same prevention.

Although so many Porro operations have been reported since May, 1876, when the first one was performed, it is remarkable that so many women have been delivered by the old method in the time given. Dr. Mangiagalli gives a record of 30, to which I add 13, who were delivered by the old operation, with a saving of 18 out of 43. As laparo-elytrotomy requires five assistants, and the Porro-Müller eight, it is evident that the old operation must continue to be performed on account of its simplicity, and especially in country practice, where help is often unobtainable.

As dropping in the pedicle after the Porro section has been so fatal, it has been proposed to open the vagina and turn the stump into it, or to turn the cervix inside out. This would certainly not guard against septic infection, as the vagina is often the medium of its entrance. After the fatal experience of Dr. Rutter, of Philadelphia, and later of Chicago, who poisoned so many women by the vaginal touch, transferring purulent matter from his own nose to this conduit, being affected with ozœna, it would certainly be unsafe to give up the plan of Porro for this extra-peritoneal substitute, in dressing the cervical stump. R. P. H.

ART. XXIII.—*St. Bartholomew's Hospital Reports.* Edited by W. S. CHURCH, M.D., and JOHN LANGTON, F.R.C.S. Vol. XIX. 8vo. pp. xxx., 425, 93. London: Smith, Elder & Co., 1883.

A SHORT paper *On the Criminal Responsibility of the Insane*, by T. CLAYE SHAW, M.D., opens with a regret, which we regret to see so authoritatively expressed, that the time seems yet as far off as ever "when the fact of a person's insanity declared emphatically by experts in mental science shall be deemed of itself, without being criticized and analyzed, sufficient to save him from the extreme penalty of the law." The present opinion of some of the highest judicial authorities, both in this country and in England, is that to establish a defence on the ground of insanity, it must be clearly proved that disease of the mind incapacitated a murderer from knowing the nature and quality of his murderous act, or from knowing that that particular act was wrong. Unless this eminently just view is sustained, instead of being

[1] The transverse incision at the internal os uteri was first proposed by Dr. Robert Wallace Johnson, in the second edition of his Midwifery, 1786, p. 308.

undermined by the efforts of medical citizens, we fear that a most important check upon the homicidal impulses of the Guiteaus and Guldstones of civilized society will be removed at the cost of constant jeopardy to life and limb.

Dr. J. A. Ormerod gives an account in the next paper of twelve cases of *A Peculiar Numbness and Paresis of the Hands*, which, without being serious, were sufficiently troublesome in some instances to compel the patient to relinquish their employments. The symptoms appear to be similar to those described by Dr. Weir Mitchell, of this city, in his work on *Nervous Diseases in Women*, and quoted at some length in this article.

The succeeding essay gives an account of four *Cases of Extra-Uterine Fœtation*, by J. Matthews Duncan, M.D., and J. Mason, M.B., who endeavour to thus contribute to the natural history of this dangerous morbid condition, and throw some light on the method of treatment by attempts to destroy the life of the fœtus. The most interesting of these cases is number four, in which, after several operations, including injection of morphia into the fœtus, tapping the amniotic sac, and electrolysis, the fœtal heart continued to beat until within two days of the mother's death. Dr. Duncan calls particular attention to the failure of morphia injections to kill the fœtus, and also to the inefficiency of a strong electrical current to destroy life, even when great local injury is inflicted upon the embryo.

The next medical paper is upon the interesting subject of *The Precipitants of Albuminous Substances in the Urine*, by Vincent Harris, M.D., in which the author considers several of the newly proposed tests, including picric acid, acidulated brine, sodium tungstate, Nessler's reagent, and potassium ferro-cyanide. From a large number of experiments, Dr. Harris concludes that sodium tungstate, and, notwithstanding Dr. Oliver's unfavourable opinion, potassium ferro-cyanide, have advantages which counterbalance the greater delicacy of picric acid, also, that all three are more convenient than nitric acid, although he imagines that few urines containing albumen will fail to give a ring with nitric acid when used as Heller's test.

In his *Notes of the Proceedings of the International Colonial Medical Congress, at Amsterdam, in* 1883, Dr. Dyce Duckworth gives a valuable account of this important convention. It was presided over by Professor Stokvis, of Amsterdam, who claimed in his opening address that it was the circumstance that Holland could with pride call itself the classic ground, the first to see colonial medicine bud forth, that made it, therefore, the soil most appropriate for the success of the First International Congress of Colonial Physicians. The Congress was divided into sections: one, that of climatology, medical geography, general pathology, and hygiene; and the other, that of special pathology and therapeutics. Among the important papers presented to the first section, were the essay of Dr. Amado, Prof. of Hygiene in the Lisbon Medical School, on the Insalubrious Trades, etc. of the colonies; those of Dr. Van Leent, M. Kruyt, M. De Mericourt, and others, on Quarantine; and that of Dr. Chevers on the modifications which certain diseases, especially the infectious ones, undergo in tropical climates.

John Mason, M.B., gives next an account of two cases of *Extirpation of the Uterus and Ovaries for Cancer*, with remarks by Mr. Willett; both of the cases, or we should rather say operations, proved fatal, one on the third, and the other during the fourth day. In the second instance the vaginal operation was performed, and Mr. Willett recommends that when-

ever a choice is given, operating through the vagina should certainly be adopted, although for "subsequent cleansing of the pelvis it is a question whether it may not be advisable to open the abdomen and carry through a drainage tube."

The following paper, *On the Pernicious Vomiting of Pregnancy*, by J. MATTHEWS DUNCAN, M.D., and W. J. COLLINS, M.D., is founded upon three cases of this distressing condition, in two of which abortion came on apparently of its own accord, and in the third was induced by the aid of a bougie and two laminaria tents, with the result of saving the mother, and affording prompt relief from all the unfavourable symptoms.

The next medical contributor is Dr. J. WICKHAM LEGG, who furnishes two papers, the first entitled *A Case of Rheumatic Purpura with Notes.* In this essay the author, after a very careful and learned dissertation upon the ten diseased conditions in which purpura manifests itself, relates in detail the symptoms of his patient, who died on the eleventh day of his illness. A very thorough autopsy was performed, and although it did not suffice to clear up all the obscurities of the case, it did much to sustain Dr. Legg in the opinion that the attack was one of rheumatic fever accompanied by purpura. The completeness with which both symptoms and post-mortem appearances, including the microscopical ones, were studied in all their bearings, reflects great credit upon the author of this article. We wish we could say as much in regard to Dr. Legg's use of the word "casuistry" near the conclusion of his other essay describing some *Cases of Congenital Pemphigus persistent from Birth*, and we suspect he would be sorely puzzled to explain the ethics, moral philosophy, or morality of pemphigus in these instances at least, unless, notwithstanding his assertion to the contrary, they should prove to be syphilitic in their origin.

J. F. BULLAR, M.D., in a paper on the *Percussion of the Lungs and Chest*, details some ingenious experiments intended to disprove certain received opinions respecting the percussion sounds in health and disease, and gives a true explanation of some of the well-recognized signs of morbid change in the pulmonary organs. In particular, his observations upon an artificial lung, made of gelatine froth strongly indicate at least that the vesicular structure of the lungs is resonant.

Dr. SAMUEL WEST records two examples of granular kidney, in which the diagnosis was skilfully made from intracranial disease; and PERCY KIDD, M.D., carefully reports an interesting *Case of Primary Malignant Disease of the Lung*, which proved fatal in about eight months.

The next article gives an account of the new *Electrical Department*, by W. E. STEAVENSON, M.B. This recent acquisition to the hospital service appears to have been arranged upon the general plan of that many years since established in Guy's Hospital, and is admirably adapted to afford all the advantages obtainable from galvanism and electricity in the treatment of disease. The cases briefly reported upon are seventy-four in number, and comprise examples of drop-wrist, loss of power and pain in the arms, facial palsy, infantile paralysis, enuresis, etc. etc., the general results being fairly encouraging, without by any means proving that the electrical fluid is the veritable elixir of life. An important part of the work accomplished appears to have been the application of the galvano-cautery, which is claimed to have been eminently successful.

Delirium with Insomnia is the title of a short essay by W. MORRANT BAKER, in which is advocated the production of sleep by chloro-

form inhalation, supplemented by hypodermic injections of morphia, in cases of delirium tremens where opium, chloral, and bromide of potassium, as so often happens, utterly fail. The author sustains his recommendations with the records of four instances in which this heroic treatment was successful; but these examples are too few in number of course to establish the safety of the procedure, and in view of the fact that sudden death is not very uncommon in mania-à-potu, it is probable that most physicians would seriously endanger their reputations in the community, should they venture on the indiscriminate employment of this method.

We pass over several short articles, chiefly reports of cases by junior members of the hospital staff, to call attention to a valuable contribution, from the pen of Dr. T. Lauder Brunton, *On the Pathology and Treatment of Some Forms of Headache.* This distressing and lamentably prevalent disorder of civilized life is carefully considered by the accomplished author, who concludes that decayed teeth and abnormalities of the eye are the common local causes of headache, although disease of the ear and nose, inflammation of the throat, and local irritation of the pericranium and of the skull, in rheumatism and syphilis, are not to be forgotten. Decayed teeth may give rise to temporal or occipital headache when the molars are affected, also probably to frontal when the incisors are the seat of caries. The following suggestions in regard to treatment are likely to prove so frequently useful to our readers that we transcribe them entire :—

"Frontal headache with constipation is usually relieved by purgatives; frontal headache without constipation, just above the eyebrows (*sic*) is relieved by acids; and a similar headache, situated higher up at the commencement of the hairy scalp, is relieved by alkalies. Vertical headache is usually associated with anæmia, and is relieved by iron. The more or less continuous headache of syphilis is usually best relieved by iodide of potassium, but in order to gain relief the dose must sometimes be much larger than is usually given, and may range from five to thirty grains for a dose. Smaller quantities of iodide of potassium are usually sufficient to cure the rheumatic headache."

Dr. Brunton accidentally discovered the value of salicylate of soda as a remedy for rheumatic headache, and has used it in doses of two and a half grains, with aromatic spirits of ammonia, every half hour with marked success.

The last medical paper is an interesting report of a *Case of Amyotrophic Lateral Sclerosis, with Microscopical Examination of the Nerve Centres, etc.*, by Robert J. Collyns, and the volume concludes with a transcript of the proceedings of the flourishing Abernethian Society, a record of specimens added to the museum, lists of prizemen, medical officers, and so forth. J. G. R.

A Pocket-Knife in the Post-Pharangeal Tissue for Seven Months.—Mr. Thomas Smith narrates one of those cases which always possess interest, although they must remain as among the curiosities of surgical literature. An insane woman aged 62, after winding a piece of cashmere around one of the blades, so as to keep it partly open, thrust her pocket-knife down her throat. Three hours after the occurrence she was seen, and beyond a slight incision over the palato-glossus muscle, supposed to have resulted from an attempt to swallow the knife wide open, as had been done, there was no evidence upon the most careful examination with a bougie that the

knife had lodged, and it was taken for granted that it had passed into the stomach. The small wound observed was the only thing to account for slight faucial irritation, which existed at first, and although there was some swelling, difficulty in swallowing, and stiffness of the neck, and the presence of the knife was suspected, and a diligent search made for it, nothing was made out by either internal or external examination. After seven months an abscess broke in the throat, and the patient, who had been gradually declining, died suddenly from hemorrhage. The conviction, which had been growing for some time that the knife was imbedded somewhere in the neck, proved upon post-mortem examination to be correct, as it was found lying in a narrow cavity immediately against the spine. Hemorrhage had resulted from an ulcerated opening into the right carotid. The knife, of which a woodcut is given, was three and a half inches long.

The next paper is also surgical, although from the pen of a medical man, being *A Case of Pyæmia, consequent on an Abscess formed after the Impaction of a Set of Artificial Teeth in the Pharynx, with Remarks on the Impaction of Foreign Bodies in the Pharynx and Œsophagus, and on their Passage through the Stomach and Intestines*, by W. S. CHURCH, M.D. A young woman twenty-one years old, wearing a vulcanite palate plate with three teeth attached, was awakened in the night of March 22d, by finding it had slipped from its position, in which it fitted badly on account of an antero-posterior fracture in the plate, and lodged in the pharynx. It was easily removed by the gentleman called in, but not without a slight wounding of the pharangeal wall. An abscess speedily followed beneath the deep fascia, which extended backwards and downwards, involving the articulation of the first rib with the sternum. On the third of April the patient was admitted to St. Bartholomew's, suffering with pyæmia, too ill for a very thorough examination, and died the next day. Dr. Church mentions a similar case as occurring in Mr. Savory's practice during the month of May, and refers to the frequency with which cases of swallowing artificial teeth are reported, and gives abstracts of cases which have been recorded in the journals. From a study of these he is of the opinion that when it is possible to do so without using too much force, foreign bodies which have lodged should be removed by the mouth; that when they are large and of irregular shape emetics should be avoided; that great care should be exercised in pushing such down into the stomach, and that when it can neither be gotten up nor down œsophagotomy is safer than delay. The paper concludes with some general remarks upon the passage of foreign bodies through the bowel and the treatment most proper to follow in such cases. Dr. Church thinks that a copious diet of indigestible food with plenty of olive oil is the most appropriate treatment. The oil is given from its tendency to form semi-solid masses in the bowels, and with the idea that such masses may so encrust projecting edges and angles as to facilitate the passage of the foreign body.

Five Cases of Tetanus, with some Remarks on its Pathology, is the title of a paper in which Mr. ANTHONY A. BOWLBY narrates the cases occurring in St. Bartholomew's during the two years preceding the issue of this volume of Reports. There were no peculiarities in the cases themselves, all terminating fatally, but the value of their record lies in the fact that in four of them careful post-mortem examinations were made, with the result that in three absolutely no morbid appearances were revealed, either in the condition of the blood or nerves. In each case, the

blood, nerves, and spinal cord were investigated microscopically. In one case there was slight opalescence of the arachnoid and turbidity of the cerebro-spinal fluid, caused by the presence of lymph, corpuscles, and granules, with slight cerebral softening. At the point of injury the divided nerves shared in the increased vascularity of the wound, but no evidence of disease was apparent in these trunks, in the spinal cord, nor in the medulla. Basing his opinion upon these cases and the quite extended research which their study induced him to make, Mr. Bowlby argues against the neurotic origin of tetanus. He shows, as is patent to the experience of all surgeons, that wounds of nerves are not commonly followed by tetanus, and refers to the fact that the large experience of Dr. Weir Mitchell with nerve injuries and neuritis is confirmatory of this view. Then the suturing of nerves practised at the present time is not at all productive of tetanus. Mr. Bowlby is disposed to question the efficacy of nerve-section above the seat of injury, and submitting to an analysis the nine cases in which relief is claimed to have followed the practice, concludes that the recoveries occurred in spite of the neurectomy rather than in consequence of it. Whether nerve-stretching will be followed by any better results is as yet undetermined by extended experience. Amputation is no more effectual in arresting the course of tetanus than is nerve-section. Reference is also made to the fact of splinters and other foreign bodies becoming imbedded in the substance of nerves without inducing tetanic symptoms; but Mr. Bowlby fails to notice those cases in which the removal of a foreign body has been followed by the cessation of the symptoms. One such case has been seen by the reviewer, where the removal of a ligature which had included a nerve was followed by an arrest of the well-marked tetanic symptoms which had set in. It should be added that chloral and morphia were freely used, but they appeared to have little mitigating effect upon the symptoms until after the removal of the ligature. Denying its neurotic origin, Mr. Bowlby, while not disposed to dogmatize, thinks that tetanus probably depends upon some form of blood-poisoning from its occasionally idiopathic origin; its prevalence in certain climates and localities; its preference for the negro race; its frequent occurrence in new-born children, where the wounded umbilical cord contains no spinal nerves, and the high temperature occasionally noted. These well-known facts, together with the observation that in one hundred and forty-three cases the wound is spoken of as being in an unhealthy state, lead Mr. Bowlby to query whether the disease may not depend upon the generation of a peculiar materies morbi which has an affinity for the nervous system as strychnia has.

The next surgical paper is by Mr. W. J. Walsham *On Trephining the Skull in Epilepsy*. Starting with a case in which Dr. Kirkwood, of Nova Scotia, had removed two disks of bone for traumatic epilepsy with partial relief, and which presented itself at St. Bartholomew's for further treatment, the paper consists of an elaborate review of the eighty-two cases accompanied with details in the tables of Drs. Billings and Echeverria. The analysis is quite elaborate, and Mr. Walsham's discussion is both thoughtful and able, but inasmuch as those tables are well known to our readers, one of them, that of Dr. Billings, being reprinted in this journal, and the reprint used by Mr. Walsham as the basis of his remarks, it would be wasting valuable space to review a review, and be little better than the shadow of a shade. We will only say that Mr.

Walsham favours a resort to operative measures not only in cases where, with a definite history, there is evident disease of bone present, but in those also with little or no history, and with no other local proof of disease than a sensitive, painful, or only tender spot. This opinion Mr. Walsham holds in view of the miserable and hopeless condition of epileptics without operation, and from his convictions as to the harmlessness of the operation *per se*. Elaborate and valuable tables covering thirty pages accompany the paper.

Mr. ERNEST COLVILLE presents *Cases from Mr. Willet's Wards*, the first being a rupture of the liver, with unusual symptoms simulating intestinal injury, the others being three cases of knee-joint affections, one of chronic synovitis, and two of loose cartilages, in each of which the joint was successfully incised with antiseptic precautions.

Abnormality of the Colon; A Cause of Unsuccessful Colotomy, is the heading of a paper by C. B. LOCKWOOD, which is interesting. During the last five years, out of sixteen thousand and thirty surgical cases admitted into the wards of St. Bartholomew's Hospital, nineteen have undergone incision for colotomy. In three of these cases the colon could not be found, and in two of the number in which a post-mortem was allowed, the failure was found to be owing to the absence of the colon from its usual position. The matter possesses considerable practical importance, as the existence of abnormalities is by no means very rare, being sufficiently frequent to have caused a failure of the operation, even in so limited a series as the one referred to in this paper. Failing to find the colon, Mr. Willet opened the peritoneum, and drew down and opened what afterwards proved to be a part of the jejunum into the wound, in the hope of thereby relieving the obstruction, but, as is stated to have always been the case when this measure has been adopted, without affecting the fatal result which very speedily followed. Mr. Lockwood commends the suggestion of Messrs. Coupland and Morris, made in a paper read at the meeting of the British Medical Association in 1877, that, when the colon cannot be found, the small intestines should be opened in the front of the abdomen, although he very justly queries as to the result when the peritoneum has already been disturbed by a prolonged search for the colon in the loin. The paper narrates several points of clinical interest in connection with one of the cases, and will repay perusal as a whole.

Notes on a Case of Ruptured Diaphragm is the title of a brief paper by R. D. BRINTON, giving the history of a case which occurred under the care of Mr. Savory. The patient, a man aged 52, was hurt by a case of machinery falling upon him. The physical signs were hyper-resonance, with feeble respiratory murmur and metallic tinkling on the left side; the heart-impulse was displaced two inches to the right, while the breathing was entirely costal. Pneumothorax was suspected, and a trocar introduced without result. The urine contained blood-corpuscles and albumen. The case was complicated by a compound fracture of the right leg, and death followed the receipt of the injuries in seventy-two hours. A small rent existed low down in the right side of the diaphragm, and one eight inches long on its left side; through the last had passed the stomach, transverse colon, great omentum, spleen, and some coils of small intestine. The heart was flattened, and the left lung collapsed.

From the Department for Diseases of the Larynx Mr. HENRY T. BUTLIN contributes a paper treating of a *Tracheal Papilloma* and of *Nasal Polypi*. The papilloma was a recurrent one, of which the history

was not finished at the time of writing. Mr. Butlin describes an operation he has devised and practised for removal of the inferior turbinated bone as the principal seat of mucous polypi, and makes some general remarks upon these troublesome growths that recur with such persistency, giving a decided preference to the galvano-cautery for their removal.

In completing this notice of all the papers that can be regarded as surgical in this volume, it is impossible not to be impressed with the fact of their fewness and comparative unimportance. As it is, several of them are by medical men, and it would appear as if the surgeons of this great hospital took but little interest in its annual volume. S. A.

ART. XXIV.—*The Surgical Treatment of Tumours and Other Obscure Conditions of the Bladder.* By WALTER WHITEHEAD, F.R.C.S.E., Surgeon, Manchester Royal Infirmary, and BILTON POLLARD, M.D., F.R.C.S. With an Appendix of Cases. 8vo. pp. 32. London: J. & A. Churchill.

ORIGINALLY printed in *The Lancet* the value of this brochure is much greater than its size indicates. It consists of a careful study of the operation of median urethrotomy for exploration of the bladder, which although not original with Sir Henry Thompson, has received a great impetus from his repeated indorsements of it. Mr. Whitehead and Dr. Pollard have done good service by preparing this pamphlet, and the importance of an operation which affords relief to cases that are otherwise hopeless, is our apology for dwelling upon the subject.

How hopeless was the condition of patients suffering from cystic tumour, was a matter of sad comment among surgeons, who have eagerly turned to a method of treatment, which as formulated and practised by Sir Henry Thompson and others, has already accomplished much. The operation in itself is simply an incision into the membranous portion of the urethra, with an insinuation of the forefinger through the prostate to explore the bladder, and the removal by the same channel of the existing tumour which has been before suspected.

After referring to the history of the operation, Messrs. Whitehead and Pollard give a succinct account of the growths which occur in the bladder. As hitherto observed, these are eight in number, viz., Fibroma, Myxoma, Sarcoma, Myoma, Enchondroma, Epithelioma, Carcinoma, and Papilloma. Enchondroma is certainly very rare, but is included by our authors upon the strength of two cases which have been recorded. Histologists will however be slow to accept the possibility of such a tumour originating in a viscus into the structure of which cartilaginous tissues do not enter, and will prefer to believe that the case reported in the *Gazette Médicale de Paris*, 1836, and the one communicated to the Société Anatomique in 1861, were inaccurately observed. Be this as it may, the one which is most frequent, which can be most satisfactorily removed by the measure under consideration, and which exhibits least tendency to return, is the papilloma, so long known to surgeons under the name of villous growth.

Fatal through repeated hemorrhages, if left to themselves, villous growths are manifested by the constant presence of blood in greater or less amount in the urine, with more or less obstruction to its flow in some cases,

and symptoms of vesical irritation. The diagnosis has hitherto been dependent upon the examination of tufts of the new growth, either passed spontaneously, or brought away in the eye of a catheter, and such exploration of the bladder as could be made by palpation, and with the aid of a sound. Our author thinks that in these persons, without enlarged prostates, it is possible to quite thoroughly examine the bladder with the aid of an anæsthetic, by inserting one or two fingers into the rectum and pressing the vertex down by the other hand placed upon the relaxed abdominal wall. In women, by dilating the short urethra and introducing the finger, it is quite easy to bring the whole bladder surface under examination by judiciously exerted pressure. But by the operation under consideration a much more satisfactory result can generally be obtained in males. Sir Henry Thompson says that a satisfactory examination can always be had in these cases, but Messrs. Whitehead and Pollard point out that the fatness of the patient, by increasing the depth of the perineum, enlargement of the prostate or unusual narrowness of the pelvic outlet, may seriously interfere with the thoroughness of the examination. The authors of the pamphlet give instances in which the first and second obstacles were met with, and interfered with the thoroughness of the exploration.

Ten cases are narrated, in six of which a tumour was found and removed, in males by perineal urethrotomy, in females by rapid dilatation of the urethra; while in four of the cases no tumour was found, but the symptoms were relieved after the urethrotomy.

In a table at the end of the pamphlet are collected and classified twenty-eight cases of tumour of the bladder occurring in males submitted to operation, of which sixteen recovered, and twelve died within three months. Twenty-eight cases of women are tabulated in which the bladder was explored through the dilated urethra. In a second table eleven cases are given in which the bladder was explored by the aid of urethrotomy, but no tumour was found.

From their analysis of all the cases Messrs. Whitehead and Pollard conclude that operations for the removal of new growths have results which compare favourably with any other major operations. Out of twenty-nine cases in which the exploration was resorted to in the three years previous to their writing, a tumour was detected in eighteen. Their tables also furnish evidence of the advantage resulting from the operation in cases of chronic cystitis, by the drainage secured, and by the facilities afforded by it for making stimulating applications to the mucous membrane of the bladder.

We may safely conclude after a perusal of this pamphlet, as well as of other publications, that the operation promises well, and would appear to be an important step forward in the healing art. S. A.

ART. XXV.—*Ueber die Knochenbrüche bei Geisteskranken.* Inaugural Dissertation (Heidelberg). Von Dr. Med. HUGO NEUMANN. 8vo. pp. 164. Berlin: G. Bernstein, 1883.

On Fractures in the Insane. Inaugural Dissertation. By Dr. HUGO NEUMANN, etc.

IN undertaking the discussion of this interesting subject, the author of the monograph before us calls attention to the varying opinions which

have from time to time ruled in regard to it. He is fully aware of the difficulty of reaching satisfactory conclusions as to the relative frequency of bone-injuries in the insane compared with similarly situated sane people, but he has collated a number of cases, and arranged and analyzed them in the hope that this would result in making the subject somewhat clearer than it was before to those who should follow him.

It requires no more than that one should accompany him as he arrays and studies these cases to become convinced that the difficulties he alludes to in his first pages are no imaginary ones, but very real and almost insuperable. In the persons of the insane and in their surroundings, there are many complications which exercise an influence, the exact extent of which cannot be estimated, to invalidate the reliability of statistics. Dr. Neumann points out the difficulties in the way of a correct diagnosis of the injuries which the insane sustain, the ease with which they may escape notice, and the impossibility in many cases of attributing them to their proper cause. Similar difficulties beset the effort to formulate precise statements in regard to the course and natural issue of fractures in the insane. As to the etiology of these fractures, there is a greater uncertainty than prevails in regard to any other aspect of the question. Here writers of different times and nations are diametrically opposed to each other. Those, for example, who are devoted to certain methods of management charge to their neglect the fractures which occur in the practice of those who differ from them in this particular. These, however, are disposed to charge such fractures to conditions inherent in the patients. To reconcile opinions so opposed would be impossible. The most that a student of the subject can do is to try to estimate the degree of prejudice which each brings to the presentation of his side of the argument, and steer the middle course, which shall prevent his making the error which may be suspected in both.

After attempting to eliminate obvious sources of misapprehension, the question arises whether or not the insane are liable more than the sane to pathological alterations in the bones which make them easier to break than normal. To this question the author replies that so much cannot be said to be demonstrated. It is clear, he thinks, that there is a condition of anomalous innervation dependent upon brain-disturbance, in which the tissues of the bones suffer directly, and not mediately through the muscular inactivity which is also present. This is the most that he feels willing to assert as the result of his studies. At their end he modestly says that the small number of observations which they have included, together with their frequent deficiency in the particulars bearing upon the question before him, permitted nothing more than a preparatory effort, to be followed up with surer results by later investigators. His own conclusions are summed up as follows: It appears that a proportion of fractures in the insane are dependent upon a certain fragility of the bones. Diseases of the bones appear in various diseases of the nervous system, as well as in psychoses. In regard to fractures appearing in diseases of the nervous system, which are relatively infrequent, he adopts the old expression, "Neurotic osteomalacia," and assumes that this condition depends upon disturbances of the nervous system, "the nature of which can only be surmised." Finally, he indicates his belief that ordinary osteomalacia may be the expression of a disease of the nervous system.

From these conclusions it may be seen how fitting is the modest tone of the author's opening utterances. Nevertheless he has made a valuable

contribution to the literature of the subject. Others who may wish to investigate will find it profitable to ascertain what he has already done, and, while some of his lines may be modified, all of them are worthy of study. It is a little unfortunate that his style is, so to speak, a little too German—that is, too involved. The absence of arrangement of his subject under heads is equally unfortunate, while an index would have been a valuable aid to his readers. There is a brief table of contents at the wrong end of the monograph, where it might easily be overlooked. But—what would atone for many greater defects—the work is concluded with an excellent bibliography of the subject. C. W. D.

ART. XXVI.—*Wharton and Stillé's Medical Jurisprudence.* Fourth Edition. Three volumes. 8vo., pp. 2330. Philadelphia: Kay & Brother, 1882 and 1884.

WE welcome with great pleasure the reappearance of this familiar and general favourite medico-legal authority. To external adornment in its faultless law binding and admirable typography, it conjoins a mass of sound, practical information upon the numerous and diversified topics pertaining to legal medicine, that impresses the reader with respect and admiration for the learning and ability of its distinguished authors.

The mere fact of the issue of a *fourth* edition of so extensive a work on Medical Jurisprudence, simultaneously with the appearance of the still larger treatise of Dr. Tidy on *Legal Medicine*, and also of the recent reissue of Professor Taylor's *Principles and Practice of Medical Jurisprudence*, shows very conclusively, that there is an increasing appreciation of the science of forensic medicine in our own country, and especially of the standard authorities of this science. Among the latter, our readers need not to be told that *Wharton and Stillé* deservedly occupies, both at home and abroad, a foremost rank.

The present edition, like the last one, comprises three separate and distinct volumes. Volume I. is "A Treatise on Mental Unsoundness, embracing a General View of Psychological Law." Its author, Dr. Francis Wharton, is well known also as the writer of *A Treatise on Criminal Law, and on Evidence*, etc. His work on *Mental Unsoundness* has for many years been regarded by both the legal and medical professions, as a standard authority on those most difficult of all cases that come before the courts—cases of mental derangement. The author informs us that much of this volume has been entirely recast by the omission of some old matter, the addition of considerable new material, and by doubling the number of cases cited.

To attempt anything like an analytical notice of this treatise, at present, would hardly be expected, although the task would be both an agreeable and profitable one to the writer. Doubtless it will receive a fitting review in the legal and psychological journals both of this country and Europe. We may, however, be permitted to say that every point connected with mental unsoundness is handled with a degree of skill and completeness which evince the profound learning and research of the author. On one subject only, will we venture a passing remark. We are

glad to notice in the section on "Insanity as a Defence to Charge of Crime" that Dr. Wharton takes such clear and logical views in relation to so-called *moral insanity*, demonstrating by sound psychological analysis that "irresponsibility from alleged moral derangement, unaccompanied with mental insanity, is untenable." In other words, that the perversion of the moral faculties (including the feelings and affections, the propensities and sentiments), by which men are led to the commission of criminal deeds, does not relieve them of responsibility for these acts, unless, at the same time, the *intellect* is unsound. Responsibility or accountability has no connection with man's instincts and propensities—these he has in common with the brute beasts,—but solely with his intellect and his free, rational will, which latter have been bestowed upon him for the very purpose of regulating and controlling these propensities. If, in any given case, there exists *reason*, then there must exist responsibility also. If it be law that a criminal shall be freed from responsibility merely because of his *moral* perverseness, irrespective of any intellectual disturbance, then, in the words of one of our chief judges, "there is no longer any responsibility for homicide, unless it be perpetrated in a calm, cool, considerate condition of mind. . . . The more violent the passion and desperate the deed, the more secure from punishment will be the perpetrator of homicide or other crimes."

The author also satisfactorily shows that the legal feeling, both in England and this country, is decidedly adverse to the recognition of *moral insanity* as a distinct form of mental unsoundness; and he further supports his position by citing in its favour the majority of the recognized writers and authorities on psychological science.

Another most interesting and perplexing subject discussed by our author is the *treatment of insane criminals*. This is, in truth, a topic of the profoundest importance both to the State and to society, and one which has by no means yet attained its full development. But we may not follow this part of the subject any farther.

Volume II. is devoted exclusively to *Poisons*, and is ably edited by Professors Robert Amory and Edward S. Wood, who have added a considerable amount of new material, and have especially enriched it with a number of new and apposite cases, illustrating points of a medico-legal interest.

As this portion of the work was fully reviewed on a former occasion, we deem it unnecessary to bestow any farther special notice upon it here, except to remark in passing, that the subject of the *Cadaveric alkaloids* or *Ptomaines*, as they have been named, receives the barest possible allusion from the editors, although these substances have been attracting considerable attention among toxicologists, especially in Europe.

Whether these bodies have a real existence or not, and whether they are invariably to be met with as the result of decomposing animal matters, are questions of very great consequence to the toxicologist, especially in his search for the different organic poisons. Their alleged existence is certain to be assumed by the counsel for the defence, in certain trials for organic poisoning, as we believe was actually done in the late trial of Dr. Lamson, in London, for poisoning with aconitine.

Under the head of *Compound Poisoning*, or the *Antagonism of Poisons*, we would also venture to suggest that this topic has scarcely been discussed sufficiently in its medico-legal relations. No notice is taken of the very important trial of Dr. Paul Schœppe, which took place in 1868 at

Carlisle, Pa., in which this very principle played a most conspicuous and important part. The prosecution, failing to sustain the first charge of poisoning by prussic acid, resorted to the then novel idea of *compound poisoning* by a mixture of morphia and prussic acid, alleging that the absence of all the usual symptoms of the last-named poison, together with the protracted nature of the sickness (the deceased lived over thirty hours), and also the failure to detect the suspected poison after death, except in "faintest traces" (which were subsequently shown were most probably due to the faulty analysis), were to be ascribed to the *admixture* of the two. To support this extraordinary doctrine, some remarkable professional (?) testimony was produced, which likened the appearance of the eyes of the deceased lady to those of a chicken-hawk, which had been poisoned years before by the witness, with a similar compound! Under such exceptional testimony, the prisoner was convicted and sentenced, and his execution was prevented only by the timely interference of scientists. On a subsequent trial, the fallacy of the preceding testimony, as also of the chemical analysis, was fully demonstrated, and an acquittal very properly was the result.

We also cannot quite agree with the editors on the subject of the *Post-mortem imbibition of Poisons*. After questioning the possibility of the introduction of a poison into the human stomach after death, for sinister purposes, the whole subject is dismissed with the remark, "This is one of the chimeras of medical jurisprudence, which the ingenuity of authors has evoked, but whose existence is fabulous, if not absurd." This opinion is not altogether in accord with the views of some other distinguished toxicologists. Orfila fully admits the possibility of this crime, though he asserts that, to his knowledge, "such a refinement of human wickedness had never been brought before the tribunals of any country;" and Sir R. Christison remarks that, although he had not known of any authentic instance of it, yet "it must nevertheless be allowed to be quite possible." (For the detail of some experiments made at the suggestion of the writer, by Dr. George McCracken, at the University of Pennsylvania, in the year 1876, see Trans. Col. of Phys. of Philada., 3d Series, vol. iii.)

Volume III. comprises the various departments of Obstetrical Jurisprudence, edited by Dr. Samuel Ashhurst, and the chapters on Violent Death from Wounds, Burns, Heat and Cold, Lightning, Starvation, Suffocation, Strangulation, Hanging, and Drowning, together with the Signs of Death, by Dr. Wharton Sinkler.

Under the head of *Rape*, the editor reaffirms (we think with great propriety) what was so well said in the former edition of this work, on the effects of etherization on women, producing false impressions upon their minds in reference to violation, more especially by dentists. We regard this subject as one of very great medico-legal importance, and fully assent to the doctrine that no case of alleged rape, under such circumstances, should ever be sustained, simply upon the assertions of the prosecutrix, *without a proper medical examination* held very soon after the alleged crime.

All the other articles under the Jurisprudence of Obstetrics are fully up to the present time, and require no farther special notice.

Under the head of the medico-legal consideration of *Wounds*, nothing practically new appears to have been added to the former copious description. Due credit is accorded to Prof. J. G. Richardson for his admirable microscopic researches in the identification of the human blood-corpuscles;

and a full appreciation is also evinced of the value of the spectroscope as an aid in the detection of blood-stains, although, unfortunately, it cannot assist us in discriminating between the blood of man and that of the lower animals, as does the microscope in many cases.

The different forms of violent death from *Asphyxia* are all thoroughly discussed, with appropriate reference to any new and important suggestions that may have been offered since the last edition of the work, displaying a faithful execution of editorial labour.

The last half of this volume deals with "Questions more distinctly legal," pertaining both to the subjects discussed in the first division of the volume, together with others, such as Survivorship, Personal Identity, Medical Malpractice, Legal Relation of Experts, Life Insurance, and Defects of Vision. Each one of these subjects is carefully analyzed by the skilful hand of Dr. Wharton, and enriched with interesting cases, which illustrate the various legal positions taken by the author, and which must impress this portion of the work with special value in the eyes of the lawyer.

In terminating this brief review of a well-known and standard book, which needs no recommendation from the writer to the two sister professions of Medicine and Law, we may be permitted to congratulate the author and his collaborateurs on the completion of their duties, and on the satisfaction of having accomplished a truly great work. J. J. R.

ART. XXVII. *The Sanitary Contrasts of the British and French Armies during the Crimean War.* By SURGEON-GENERAL T. LONGMORE, C.B., Q.H.S., F.R.C.S., etc., Professor of Military Surgery in the Army Medical School; Associate of the Society of Surgery of Paris; Officer of the Legion of Honour; etc. etc. 8vo. pp. 31. London: Charles Griffin & Co., Exeter Street, Strand, 1883.

IT is a pleasure to read this clearly written and instructive sketch, by Surgeon-General Longmore, of some of the leading events in the sanitary history of the Crimean war. It is more than a quarter of a century since the great military drama of the Crimea attracted the gaze of the whole world, and the features of that notable campaign are fast receding into the distant past. It is not to be intimated that the governments most concerned, have failed to faithfully record the history of this gigantic struggle. A great mass of information was collected at the time, and the British and French governments have preserved elaborate medical and surgical histories of their respective armies during the war. These histories and reports are of the highest value, since they embody an experience hitherto unexampled, and which, in its peculiar character and associations, is not likely to be repeated. To present with impartiality and completeness the lessons which this experience teaches, requires patient research, clear and unbiased judgment, and a comprehensive knowledge of the subjects involved. No one is better qualified for such an undertaking than Professor Longmore.

In the present monograph, he has selected as the subject of an inquiry "the relative sanitary conditions of the allied French and British armies

at corresponding dates, when they were acting side by side in the military operations before Sebastopol." The contrasts which this study presents are striking; and the lessons it teaches impressive.

It is important to note that the situation of the two armies was precisely similar in respect to soil, locality, and climate; and the nature of the work in which they were engaged practically the same. It is therefore a peculiar fact, that the British part of the allied force was in a remarkably unhealthy condition during the first part of the siege, and in as remarkably healthy a condition during the latter part of the siege, while a precisely opposite condition of affairs existed among the French troops, which were in a good state of health during the first period, but extremely sickly during the second period. The elucidation of the causes which led to these opposite conditions is a problem which requires elaborate research and impartial investigation.

The conclusions arrived at by Prof. Longmore are substantially the following. The lamentable condition of the British troops during the first part of the war was due to two great factors—"the want of preparedness on the one hand, the neglect of even the elementary teachings of sanitary science on the other."

The fair average standard of health among the French troops during the same period, is attributed to their thorough equipment for service in the field, and to their more thorough knowledge, gained probably by service in Algeria, of the practical matters relating to the economy of health. They were in possession of a most admirable transport service, which was of the greatest value in enabling them to be regularly supplied with the requisite food, clothing, warmth, and for relieving the hospitals from demands beyond those for which they were adapted. They were, however, neglectful of the conservancy of their camps, an important matter, which, had it received proper attention, would, doubtless, have improved the standard of health.

The improved condition of the health of the British army during the second winter, is stated to have been due to extraordinary efforts made by the Government and by the people at home to supply the serious deficiencies in organization and equipment, so soon as the results of this neglect were made known; and to a systematic and rigid attention to the conservancy of the camps, and all needed sanitary requirements. The result was a complete transformation from a state of deplorable sickness to one of vigorous health.

The question remains to be answered, why it was that the French army suffered so terribly from sickness the second winter, while the British army maintained a very favourable condition of health. The French were still under canvas, while the English were comfortably housed in wooden huts sent from England. The military position had been extended, and the distance from the base of supplies prolonged, and therefore the difficulties of transport became aggravated with consequences similar to those from which the British army suffered the first winter. The main reason, however, for the frightful condition of health was the neglect of the sanitary department of the military service. The advice of the medical officers in the field, in regard to measures necessary for maintaining the health of the troops, was unheeded at home, and the consequence was the development of scurvy and typhus, which increased to such alarming proportions as to render all efforts at hand to suppress these scourges en-

tirely futile; and the army was really obliged, from exhaustion by disease, to relinquish a prominent part of the undertaking.

These are mainly the facts which are so admirably presented in this most interesting pamphlet. It is seldom in the world's history that a similar opportunity has occurred for studying, on so large a scale, the impressive results of the neglect of the principles of sanitary science. The practical lessons taught by this bitter experience should never be permitted to pass out of mind. Guided by this conviction, Surgeon-General Longmore has well succeeded in placing on record the true sanitary contrasts presented by the British and French armies in the Crimea, which will be a source of instruction, not only to the army surgeon but to the sanitarian and medical practitioner, for all time.

A short description of the outbreaks of cholera in the French and British armies during the war is furnished in an appendix. W. H. F.

ART. XXVIII.—*Practical Pathology: a Manual for Students and Practitioners.* By G. SIMS WOODHEAD, M.D., F.R.C.P.E., Demonstrator of Pathology in the University of Edinburgh, etc. etc. With 136 coloured plates. Pp. 484. Edinburgh: Young & Pentland, 1883.

THIS manual, a volume of nearly 500 pages, is designed as "a guide to the practical work involved in the study, preparation, and examination of morbid tissues." In order to make it serve this purpose, the author intends "to describe the method of making the *post-mortem* and naked-eye examinations, and of preparing the various structures for microscopic examination." This study involves the consideration of the more important changes of each organ. We are thus led to expect the essentials of a work on diagnosis in pathological anatomy, of another on microscopic technology, and of a third on pathological histology.

It is unnecessary to state that there are already excellent treatises on all these subjects, and it is quite possible for one familiar with the ground to be gone over and the needs of the student, to prepare a single volume which shall truly serve as a practical manual to fulfil the objects stated in the preface.

We doubt if the author would find it necessary or convenient, even when possible, to provide himself with the various instruments and paraphernalia recommended for making an autopsy, especially if he were to visit a private house for this purpose. Certainly the students and practitioners for whom this book is intended might be excused if they availed themselves of the suggestion that many of the instruments mentioned might be left behind. It is more important for them to know in the first place what is absolutely essential, and then to learn what may prove useful or convenient. The omission of collodion and India-rubber gloves or gauntlets from the list is notable, although he may have found them unnecessary. The constant use of the latter is not to be recommended, but their presence when needed may prove invaluable.

The sections on hardening and staining fluids are very good, special prominence being assigned to those articles which are most constantly used. All microscopical examinations by beginners, however (and it is

for them in particular that a practical manual is needed), should be made after the autopsy is finished, and preferably in a place where the examiner has leisure, instruments, and reagents.

The chapters relating to the pathological changes in the various organs are by no means of uniform merit, and it is to be regretted that exceptions have to be occasionally taken to statements made by the author. Least of all should a student be advised to form a judgment as to the condition of cloudy swelling from the examination of a hardened specimen. The colored drawing illustrating this condition in the liver is characteristic of nothing else than a cellular infiltration of Glisson's capsule. Such a condition is most suggestive of an incipient interstitial hepatitis, and, in our experience, is oftener absent than present, even in the more extreme forms of granular degeneration of the liver.

The author's ideas of fatty degeneration of the liver are not in harmony with those of other observers, when he applies the term "atrophic or wasted" to the fatty degenerated liver found as a result of poisoning with arsenic. Certainly the accompanying drawing is indicative merely of a fatty infiltration of the peripheral region of the lobules, notwithstanding the explanatory statement that a peripheral fatty degeneration accompanies the fatty infiltration.

In the recognition of fatty degeneration, as in that of cloudy swelling, the necessity of the examination of fresh specimens is not sufficiently insisted upon. The drawing given as an illustration of the fatty degeneration of the cells of the liver is by no means characteristic. The observer who obtained such results from the use of osmic acid would be justified only in the recognition of the presence of fat; the difference between such appearances and the familiar "granular corpuscle" is extreme. We notice, by the way, an ingenious treatment of this drawing, which is inverted and subsequently presented in the section on tubercle of the liver.

Dr. Woodhead adopts the prevailing French views concerning interstitial hepatitis. These are not in harmony with those of many other authorities. As his drawing of "biliary cirrhosis" is not original, it is to be presumed that his statements are not wholly based upon individual observation.

The illustration of gummous hepatitis seems indicative of nothing else than a chronic interstitial hepatitis. Nothing is to be found suggestive of a gumma, although the author's description of this product of syphilis makes it apparent that he is familiar with the lesion in question.

In connection with his description of the "typhoid lesion" of the liver, it may be suggested that such appearances are found associated with the putrefactive changes sometimes described as emphysema of this organ. It seems not unlikely that the small, yellow specks referred to are the result of putrefactive changes which are of exceptionally early occurrence and wide distribution in the liver in cases of typhoid fever and dysentery.

Without attempting further unfavourable criticism in detail, it may be said that the work fills a certain gap, since it unites methods of examination in pathological anatomy and pathological histology. The illustrations are sumptuous with colour and very pleasing to the eye, when characteristic. They do not teach more than black and white, except, perhaps, in the case of amyloid degeneration. The colouration necessarily adds to the cost of the illustration, and it may be said that the practical needs of the student and physician as met in this book are likely to be better served and at less expense.

There are books in English which cover the entire ground, excepting the detailed application of histological methods to pathological investigations. This gap might be easily and satisfactorily filled by a translation of Friedländer's Microscopische Technik, which could be so amended as to include the modifications of methods devised during the past two years.

R. H. F.

ART. XXIX.—*Contagious and Infectious Diseases; Measures for their Prevention and Arrest. Smallpox (Variola), Modified Smallpox (Varioloid), Chickenpox (Varicella), Cowpox (Variolæ Vaccinæ), Vaccination, Spurious Vaccination.* Illustrated by eight coloured plates. Circular No. 2. Prepared by JOSEPH JONES, M.D., President of the Board of Health of the State of Louisiana. 8vo., pp. 410. Baton Rouge, 1884.

THIS production covers four hundred and ten pages of closely-printed octavo, and was prepared ostensibly for the guidance of the quarantine officers and sanitary inspectors of the Board of Health of the State of Louisiana. The author states in the Preface that this work has been rendered necessary by reason of the prevalence of smallpox in the States bordering on the Mississippi River, thus placing the inhabitants of Louisiana, from her geographical position, in constant danger of infection; also because of the peculiar race-conditions of the lower sections of the Mississippi Valley, as well as the neglect of vaccination by large masses of the population, and the growth of a sentiment opposed to it on the part of both the profession and the people.

According to the author, no city upon the globe is more exposed to the introduction and spread of smallpox than New Orleans. This city contains a larger coloured population that any other in the United States, and the negroes not only neglect vaccination, but are opposed to this measure; hence New Orleans also is believed to have the largest population unprotected against smallpox. During the first eight months of 1883, 1164 persons perished from smallpox; and during that year nearly one-fourth of all the deaths which occurred in New Orleans resulted from that terrible yet preventable disease.

The opposition to vaccination is said not to be confined to the uneducated and comparatively helpless coloured race, but bitter opponents have also been found amongst the white race, and, worse still, in the ranks of the medical profession, whose efforts have thus far defeated all measures to eradicate smallpox, by opposing the enactment of either local or State laws making vaccination compulsory. The Act of 1877 empowers the Board of Health of New Orleans "to execute the necessary rules and regulations with reference to vaccination, provided that it be not made compulsory." Of course, "rules and regulations" under such limitations amount to but very little. The causes of the opposition to vaccination the author gives as follows:—

"1. Ignorance, superstition, and prejudice.

"2. Stupid and malicious opposition to all measures emanating from the Board of Health for the protection of the health and lives of the people.

"3. Disbelief in the protective powers of vaccination.

"4. A popular superstition that vaccination, during the prevalence of smallpox, tended to develop the disease in the person vaccinated.

"5. The belief held by many people and by some physicians, that the vaccine virus has degenerated since its introduction by Edward Jenner in 1798.

"6. The frequent failure of the bovine virus furnished by the various vaccine farms of the United States.

"7. The dread of contracting syphilis, phthisis, erysipelas, scrofula, and leprosy, through the medium of the vaccine virus.

"8. The dread of contracting various diseases of animal origin, through the medium of the *bovine virus*."

The difficulty of procuring reliable vaccine material in the South during the rebellion, as well as the horrible results which then frequently followed the supposed vaccine disease, appear to have given rise to most of the objections to vaccination named above. A very lengthy and sad account is given of some of the more remarkable abnormal phenomena which this so-called vaccination produced among the Confederate soldiers, and more especially among the Federal prisoners confined at Andersonville. The author is inclined to believe that many of these unfortunate results are attributable to a scorbutic condition of the blood.

He says: "In scorbutic patients, all injuries tended to form ulcers of an unhealthy character, and the vaccine vesicles, even when they appeared at the proper time, and manifested many of the usual symptoms of the vaccine disease, were nevertheless larger and more slow in healing, and the scabs presented an enlarged, scaly, dark, unhealthy appearance. In many cases, a large ulcer, covered with a thick laminated crust, from one-quarter to one inch in diameter, followed the introduction of the vaccine matter into scorbutic patients. Matter from these scabs and sores was frequently used in vaccination, and this decomposing pus and blood acted as an animal poison in some cases, and especially in constitutions debilitated by exposure, fatigue, and salt diet.

"During the prosecution of the investigations which we instituted upon the diseases of the Federal prisoners confined at Andersonville, the opportunity was embraced of investigating the remarkable effects which followed the attempts of the Confederate medical officers to arrest the spread of smallpox by vaccination. In a number of cases, large gangrenous ulcers appeared at the points where the vaccine lympth had been inserted, causing extensive destruction of tissues, exposing arteries, nerves, and bones, and necessitating amputation in more than one instance." . . .

The author endeavours to exonerate from all blame the medical officers who directed and performed these vaccinations; but it must be evident to every student of vaccination that selecting and using matter from "scabs and sores" containing "decomposing pus and blood" is evidence of gross carelessness or ignorance, and that the horrible results just referred to might very readily follow the use of such virus. In seeking for the causes to which to attribute the injurious effects of vaccination among the Confederate troops and others in the South during the war, the author very frankly concludes that they should be arranged substantially as follows: 1st. Depressed forces; vitiated and scorbutic condition of the blood of the patients vaccinated. 2d. The employment of matter from pustules or ulcers which had deviated from the regular and usual course of development of the vaccine vesicle. 3d. Dried vaccine, lymph, or scabs in which decomposition has been excited. 4th. The mingling of vaccine with smallpox virus. 5th. Dried vaccine lymph or scabs from patients who suffered from erysipelas during the progress of the vaccine disease, or who were exposed to the exhalations from typhoid fever, erysipelas, hospital gangrene, pyæmia, and offensive suppurating wounds.

6th. Fresh and dried vaccine lymph and scabs from patients suffering from syphilis.

Besides the abnormal phenomena already mentioned, the author cites a large number of instances in which syphilis was communicated by so-called vaccine virus taken from soldiers affected by constitutional syphilis. With such facts as these before us, we are not surprised at the strong opposition to vaccination throughout the Southern States. But fortunately an investigation of the facts show that these evils are not the result of true Jennerian vaccination, but of gross and inexcusable carelessness or ignorance, and consequently they could and should have been wholly avoided, not only for the relief of the sufferers, but because such accidents always tend to bring vaccination unjustly into disrepute.

A desire to overcome this opposition to vaccination seems to have been one of the principal motives of the author in the preparation of his book; he commences this laudable effort by reproducing, *in extenso*, the three earliest publications of Jenner, entitled, "*An Inquiry into the Causes and Effects of the Variolæ Vaccinæ.*" "*Further Observations on the Variolæ Vaccinæ.*" "*A Continuation of Facts and Observations relative to the Variolæ Vaccinæ.*" These are followed by a very full account of Jenner's instructions for vaccine inoculation. Surely there is no better way of imparting a correct knowledge of vaccination, and overcoming opposition to it, than by placing in the hands of the profession and public vaccinators the original teachings of the great author of the practice. Dr. Jones has certainly done the profession a great favour, and the cause of vaccination a great benefit, by the republication of these valuable papers, which for a long time have been very difficult to obtain or consult, even in the best medical libraries of this country.

Next follows the reproduction of a lengthy paper by George Pearson, M.D., on "*Inquiries concerning the Cowpox.*" This publication (November, 1798), followed so soon after Jenner's first paper (June, 1798), that its author, who was already under suspicion of wishing to share the honours of Jenner, felt called upon to say:—

> "Perhaps it may be right to declare, that I entertain not the most distant expectation of participating in the smallest share of honour, on the score of discovery of facts. The honour on this account, by the justest title, belongs exclusively to Dr. Jenner; and I would not pluck a sprig of laurel from the wreath that decorates his brow."

We think it not improper to state that Dr. Pearson soon became (if he were not so then) very jealous of Jenner's reputation, and one of his most bitter enemies. He even went so far in his feelings of opposition as to apppear before the Committee of the House of Commons, and oppose a grant of money to Jenner, which had been proposed in the House of Commons as a suitable compliment, in honour of his great discovery. But notwithstanding the opposition of Pearson and others the grant was voted to Jenner.

Of this collection of old publications presented by the author, the next one is by Wm. Woodville, M.D., entitled, "*Reports of a Series of Inoculations for the Variolæ Vaccinæ or Cowpox;*" etc. We think a more appropriate title for this paper would have been *Reports of a Series of Inoculations for the Smallpox;* for Dr. Woodville conducted his vaccinations in such a careless way that his cowpox virus became mixed with that of smallpox, and the result was that more than one-half of his "vaccinated cases" broke out with an eruption over the body. The error

of Dr. Woodville, as pointed out by Jenner, consisted in inserting small-pox matter into the arms of patients on the third and fifth days after vaccination, and subsequently collecting virus from such patients, for further use. These errors, which were committed by both Drs. Woodville and Pearson, have been very fully considered by Dr. Jones.

Several other papers, reports, and excerpts of interest, all serving to give a historical idea of smallpox, vaccination, and some of its so-called accidents, have been collected together in this volume, but time and space permit us only to mention some of them by title. "*Report of the Royal College of Physicians of London, on Vaccination*," etc.; "*Investigations of Dr. Alexander Monro, on Smallpox and Vaccination*;" "*Mr. Bryce's Test for Successful Vaccination*;" "*Dr. Thompson's Theory of the Identity of Chicken-pox and Modified Smallpox*;" *An Account of the Introduction of Vaccination into the United States*; "*The Natural History of Cowpox, by Robt. Crely, with coloured Illustrations*;" "*Spurious Vaccination*;" *An Account of the Series of Vaccino-syphilitic Inoculations at Rivalta, Lupara, Bergame, and Auray; also an Account of the Series recorded by Mr. Jonathan Hutchinson.*

Although this work is largely a compilation, yet it contains evidence of original investigation and research. The author presents a carefully prepared table embodying his observations upon the physical and chemical properties of the urine in smallpox. The result shows that urea, uric, phosphoric, and sulphuric acids increase during the progress of the disease, and that there is a diminution and even total disappearance of the chloride of sodium. His "*Researches on Spurious Vaccination in the Confederate Army*" bear evidence of an amount of correspondence and labour which but few would be willing to undertake. We have already referred to this research in commenting on the horrible results of these "spurious vaccinations," and have insisted upon greater care in the selecting of vaccine material. We can, therefore, heartily indorse one of the conclusions arrived at by the author, namely: "It is the duty of municipal, state, and general governments to regulate and foster a correct system of vaccination, and to institute and sustain the necessary establishments for the supply to all citizens, regardless of condition or race, supplies of pure vaccine matter, derived from healthy human beings, or from animals suffering with the natural cowpox, or from a system of inoculation of cowpox from heifer to heifer, or repeated and continuous successions; such general, municipal and state regulations should embrace the revaccination of all persons at the age of sixteen years, and such persons so vaccinated may be regarded as permanently protected."

While we cannot agree with the author in all he has written, we must nevertheless conclude that, upon the whole, the work is valuable. The papers of Jenner alone make it worthy of a place in every medical library. W. M. W.

ART. XXX.—*Labour among Primitive Peoples: showing the Development of the Obstetric Science of to-day, from the Natural and Instinctive Customs of all Races, civilized and savage, past and present.* By GEO. J. ENGELMANN, A.M., M.D., Professor of Obstetrics in the Post-Graduate School of the Missouri Medical College, Master in Obstetrics of the University of Vienna, etc. Second edition, revised, enlarged, and re-arranged. Fifty-nine illustrations. St. Louis: J. H. Chambers & Co., 1883.

THIS book is the development of a paper read by Dr. Engelmann before the American Gynæcological Society in 1880. The first edition was issued in 1882, and we are glad it met with such professional appreciation that so short a time has passed before a new edition was required. The author states in the preface that "it is owing to the interest and energy of the publishers" he is enabled to "present this second, thoroughly revised, completely changed, and very much enlarged edition to the profession."

The work is divided into five chapters, as follows: Pregnancy, Parturition and Childbed, Posture in Labour, The Third Stage of Labour, Massage and Expression, and, finally, Characteristic Labour Scenes among the Yellow, Black, and Red Races.

It is needless to tell our readers that this is one of the most interesting contributions to professional literature; it contains many curious facts derived from various parts of the world, and from various ages. But we cannot share with the learned and industrious author in his belief that "a vast and important fund of knowledge may be derived from a study of the various positions occupied by women of different peoples in their labours." Is, for example, the instinct which is supposed by Dr. E. to govern the position of a woman in labour, among savage people, wise which makes the parturient stand, or be suspended partially, or entirely? Is it not better to follow "modern obstetric fashion?" Most serious accidents have occurred when civilized women have been accidentally delivered in the erect posture, such as the child being killed by falling on the floor, and the mother having her uterus inverted.

Again, can we be quite sure that certain positions are taken by women in labor from instinct, or from education, wise or foolish, as the case may be? So, too, it may be that a parturient takes an instinctive position not for the purpose of accelerating labour, but for the relief of suffering. For example, a woman in the first stage of labour, during a "pain" instinctively inclines her body forward, probably just as any one, male as well as female, with any severe abdominal pain also makes a similar inclination to relieve sensitive parts from pressure by abdominal muscles. Another explanation that has been given of this forward inclination of the parturient is that thus she withdraws the presenting part of the fœtus from pressure upon the lower portion of the womb. Now this movement, though instinctive, has nothing to do with assisting labour.

We do not believe Dr. Engelmann himself, with all his admiration for the wisdom of instinct, ever advises St. Louis ladies to go through the martyrdom of maternity in the erect position, whether simply standing, or swinging on the limb of a tree; for he distinctly states that "the semi-recumbent position is the most serviceable, and should be adopted as the obstetric position in all ordinary labour cases; it is preferable to the

kneeling or squatting." But if instinct is to be the guide, should we reject the other positions which so many savage women have taken in labour? It puzzles one to explain why instinct, if wise and truthful, tells so many different stories upon the subject—one woman delivered standing, another suspended to the branch of a tree, another on all fours, another squatting, another kneeling, another sitting with her body inclined forward, while still another has her body inclined backward, and so on through other positions. Which of all these statements on the part of Dame Instinct is true?

Nor are we quite willing to accept the rule which Dr. Engelmann has given as to selecting the semi-recumbent position in all ordinary labour cases. Certainly the fact that perineal tears are more frequent when the patient is on her back than when she is on her side, presents a very strong argument in favor of the side position, at least during the close of the second stage of labour.

But we must end our remarks in regard to this very interesting book. The author has done his work so well that future writers upon the subject must simply repeat the results of his large, patient, and valuable researches. We are glad to know that this volume has had the high compliment of translation into German. T. P.

ART. XXXI.—*Health Reports.*

1. *Seventh Annual Report of the Board of Health of the State of New Jersey.* Woodbury, 1883. Pamph. pp. 391.
2. *First, Second, and Third Annual Reports of the Secretary of the State Board of Health of West Virginia for the years* 1881, 1882, *and* 1883. Wheeling, 1883. Pamph. pp. 305.

THE *New Jersey* Report gives as usual abundant evidence of the active exertions of the board under the stimulating influence of its untiring secretary, Dr. Ezra M. Hunt, late President of the American Public Health Association, to "render life more vigorous, and death more remote" for every inhabitant of the State. The total number of deaths for the year ending July 1, 1883, was 23,310, being a considerable reduction from the previous year, whilst the marriages and births have both increased. The relation of the State to local boards has proved mutually advantageous, and it appears that both the public and local health authorities are realizing the great value of those improvements which secure good water, proper disposal for decomposable substances, good houses, cleanly habits, and chances of employment deprived of all avoidable insanitary conditions. Several cities and townships have, it is stated, entirely modified their health administration, and others are so agitating the need as to be sure eventually to bring about desired results. It is gratifying to find that the sanitary officials, in their efforts to abate nuisances, have received just and timely aid from the legal tribunals of the State, notably in the Bound Brook mill-dam case, and in regard to the enforcement of the Milk-adulteration Act, for which all the babies of New Jersey at any rate should rise up and call the judges blessed. Much good work has been

done in securing a purer water-supply, as, for instance, at Princeton and at Atlantic City, where the improvements are said to mark an advance in its history; but this important field of labour for the good of the community is apparently by no means exhausted, and the same remark is still more emphatically true of the methods of sewer-construction and sewage-removal. Malarial disease is recorded as being less prevalent than in previous years; but as a means of still further reducing its frequency, a strong plea in favour of securing a dry soil, with the ground-water at least ten feet below the surface as the site for either groups or single habitations, is advocated. Smallpox has also given less cause for anxiety, but the great prophylactic of vaccination is still wisely urged of course, and the statement made both in regard to variola and cholera, which may visit us this summer, that "our power to prevent epidemics is almost absolute if we meet them at the threshold, or have hold of the checks, and apply them in time."

The first paper is an elaborate one *On the Health in the Home and its Surroundings*, by EZRA M. HUNT, M.D., in which the author, in view of the fact that no matter how greatly municipal sanitary care is exercised, the health of the people largely depends upon the sanitary condition of the house, endeavours to furnish a plain outline by which the ordinary householder may know how to regulate his dwelling and the surrounding premises with the best advantage to health. He therefore gives easily-understood directions for arranging the drainage construction, warming, ventilation, and so forth, of a house to secure the most favourable conditions for health.

In the next paper Dr. DAVID WARMAN, of Trenton, discusses *Places and Modes of Interment*. He dismisses cremation in a single paragraph as being demanded by neither sentiment nor sanitation, and open to the almost insuperable objection that it would afford facility for concealing certain crimes, such as poisoning, adding the further astounding statement that cremation would render identity (identification?) in other cases impossible. Our author, after a very full exposition of the dangers of the living from the decomposing bodies of the dead, declares that the sanitary requirements for a cemetery are a suitable soil, a suitable position with respect to population and sources of water-supply, sufficient space, and proper regulations and management. We grant that these conditions if fulfilled would do much to diminish the great evils which attend inhumation as now generally adopted, and such fulfilment may seem quite practicable to the rustic or suburban intellect, yet we fail to subscribe to the spirit of the closing quotation from Dr. Wickes's essay on *Sepulchre*, that "rural cemeteries properly regulated, under wise control, guarded by good laws, and permanently extra-mural, afford all necessary protection to the public health."

The next two papers are contributed by the energetic secretary, Dr. HUNT, and refer to *Sanitary Inquiries in regard to Health Resorts* and to the *Condition of Charitable and Penal Institutions*. Details furnished in the former are of great interest to the army of pleasure-seekers who search for health and amusement at the seaside watering places on the New Jersey coast, and should be consulted by physicians who are called upon to advise their patients respecting the drainage and water-supply of these localities.

Two papers on *School Hygiene* and on *Cleanliness in Schools*, by JAMES GREEN, Principal of the Long Branch High School, and the Rev.

F. R. BRACE, Superintendent of Schools for Camden County, respectively make earnest appeals for that due attention to sanitary care of school-houses and their surroundings which is so vitally necessary to the rising generation.

The subject of school hygiene, with many others of great sanitary importance, is further discussed in the *Abstracts from Addresses and Papers of the New Jersey Sanitary Association* for the past five years, prepared by the secretary, who also contributes the succeeding timely essay on *Trades and Occupations* from a hygienic point of view, which gives some results of observations now going on in various parts of the State in regard to this important subject.

After a *Summary of Reports from Local Health Boards*, also furnished by the secretary, is placed a *Report of the Committee of Public Analysts and Inspectors of the State Board of Health*, made through its able chairman, Professor A. R. LEEDS, from which it appears that the principal new features of their work during the past year, have been the effort to exclude from the State all kerosene oil below the prescribed standard. Also the determination, after carefully re-examining the composition of milk produced in the State, that the standard prescribed by law for market milk had not been set too high. Professor Leeds wisely urges the appointment of an executive officer, properly authorized and remunerated, to carry out the law in regard to the adulteration of food, drink, and drugs, which, as has been shown by the almost gratuitous investigations of the public analysts, is so important should be done.

The next paper is a *Special Report of the State Milk Inspector*, Dr. WM. K. NEWTON, of Paterson, who declared that the law to prevent the sale of impure milk has worked exceedingly well this (past) year, and it is to be hoped the Legislature will refuse to sanction any attempt to alter or weaken it. In this report an interesting series of sixty-five analyses of milk from herds of cows in all of which the total solids exceeded twelve per cent., which is the standard fixed upon by the framers of the State law on the subject, is tabulated.

The remainder of the volume is taken up with reprints of circulars and laws, the register of physicians, and the report on Vital Statistics, concluding with the valuable quinquennial tables of marriages, births, and deaths.

From the *West Virginia* Report we find that the Board of Health has been fortunate enough to secure for its secretary the highly esteemed physician and well-known author, James E. Reeves, M.D., of Wheeling, whose earnest devotion to the great cause of preventive medicine is manifest throughout the entire volume. The minutes of the meetings of the Board from its establishment in June, 1881, with its rules, register of qualified physicians, etc. etc., occupy nearly the first half of the book, the remainder of which is devoted chiefly to special papers on sanitary subjects. Several of these are brief compilations requiring no further notice than an earnest recommendation to the people of West Virginia and elsewhere who are unacquainted with the important hygienic instruction they inculcate.

Among the articles to which space permits of more detailed reference, may be mentioned that *On Nailer's Consumption, and other Diseases Peculiar to Workers in Iron and Glass*, by JOHN L. DICKEY, A.M., M.D., of Wheeling, which gives the results of observations upon 5700 men and boys employed in iron and nail factories, and 2650 operatives

in glass-works. From these it appears that the nailers are so much exposed to the steel and stone dust from dry grinding, as to render their occupation very hazardous. In spite of the fans used in two of the mills and inspirators of various kinds worn by some of the workmen, the risk of consumption is so great that certain of the life insurance companies refuse to accept any nailer, no matter what may be the result of a thorough physical examination in his case. In regard to the glass-workers, although they are subject to burns of a more or less severe character, their occupation seems to be a healthy one, and those who live temperately and take good care of themselves, enjoy ordinary good health, and fill out the full average of years.

Several of the succeeding papers are reprinted from other State Board of Health Reports, etc., and have been already noticed in this Journal, but the timely essay *On the Eminent Domain of Sanitary Science, and the Usefulness of State Boards of Health in Guarding the Public Welfare*, by the Secretary, Dr. JAMES E. REEVES, read before the American Public Health Association at Detroit last November, has not yet come before us. Anticipating the due course of its consideration we desire here to call attention to the eloquent arguments advanced by Dr. Reeves, in favour of establishing throughout the United States, the high standard of medical education required in Illinois and West Virginia, demanding as it does diplomas from colleges where at least the eight great branches of medical science are thoroughly and systematically taught.

Another important article also, read by its author, D. E. SALMON, D.V.M., before the Public Health Association at the Detroit meeting, is that *On the Texas Cattle Fever—is it a Chimera or a Reality?* Dr. Salmon concludes that the time has long passed when we can try to explain away the terrible losses that have been traced only too certainly to the cattle from Southern ranges, and that the hundreds who have lost their all, through ignorance of the existence and characters of this plague, the thousands of square miles of territory that are ravaged almost annually, are enduring evidence of the reality of Texas fever. This essay is illustrated with a handsome chromo-lithograph exhibiting the microscopic appearances of the spleen in this disease, and in an appendix on the medical treatment of Texas fever, prepared especially for the West Virginia report, Dr. Salmon, after declaring that there is no specific as yet known, urges that the great point is to *prevent* the disorder, and as cattle only contract it by running on grounds which have been poisoned by other cattle, from the permanently infected district of the South, this is usually not a difficult matter. This permanently infected district Dr. Salmon promises to outline more in detail in the reports of the United States Department of Agriculture, to which he refers all those who contemplate the purchase of Southern cattle.

Brief articles on *Foot and Mouth Disease* (*Aphthous Fever*), by L. D. WILSON, M.D., of Wheeling, *Foot-rot in Sheep*, by C. S. ROBINSON, V.S., of Wheeling, and on *The So-called Pink Eye and Horse Scarlet Fever*, by JOHN C. PETERS, M.D., of New York, complete the section devoted to veterinary medicine, a feature of the work of the Board of Health which we are sure might be greatly extended, and imitated in other States, with almost infinite advantage to the community at large.

J. G. R.

ART. XXXII.—*Eczema and its Management: a practical Treatise based on the study of three thousand cases of the Disease.* By L. DUNCAN BULKLEY, A.M., M.D., etc. Second edition. 8vo. pp. 344. New York: G. P. Putnam's Sons.

IN our notice of the first edition of Dr. Bulkley's book we took occasion to point out in a general way the scope of the work, its merits, and, what appeared to us, its defects. As the general plan of the book has not been changed, and as the additions and amendments are few in number and only such as would naturally suggest themselves to an author whose already extensive experience has been constantly augmenting, we shall, in the present notice, merely call attention to those features which present themselves in a reperusal of its pages.

The earlier chapters, devoted to general considerations, definition and nosology of eczema, the frequency of eczema, the symptoms and pathological anatomy of the disease, its nature and causes, do not differ to any marked degree from the similar chapters in the first edition.

In opposition to the views of what used to be the German school, Dr. Bulkley is a firm believer in the general or constitutional nature and causation of the disease, maintaining that local agents are found to play only a secondary part as exciting causes, being incapable alone of producing true eczema. While denying the influence of heredity as a general cause, Dr. Bulkley admits that this exists in a small number of cases, rendering such much more difficult of treatment, though not acting as an effectual bar to cure. Gout in one generation may result in eczema in the succeeding one, while scrofula or struma may act in the same way. The neurotic state, also, predisposes to eczema.

Imperfect assimilation and disintegration are the elements comprising the gouty state as recognized by Dr. Bulkley; and imperfect digestion, constipation and diarrhœa, imperfect urinary secretion, and faulty cutaneous action are the clinical signs by which these are recognized.

The strumous state, as evinced by the usual symptoms connected with the idea of this condition, is a marked predisposing agent in the production of eczema. The tendency of the eruption in such cases is toward pus production, differing in this from the eruption of the gouty subject, which is apt to show a red, highly inflamed surface, with a thin glairy secretion, drying into lighter, whiter scales.

The neurotic state is usually observed only in eczema of adults; but is, according to Dr. Bulkley's view, daily being recognized more and more as an etiological factor.

In addition to the predisposing causes just mentioned, the following exciting causes are enumerated by Dr. Bulkley: Dyspepsia and constipation, menstrual disorders, lactation, dentition, the presence of intestinal worms, and varicose veins, are among the chief of these. Among local causes: cold, occupation, the external application of irritants, scratching, etc.

The chapter on etiology is, in our opinion, one of the most suggestive and valuable in the book; and, though far from agreeing with the author on every point, we cordially invite the attention of the practitioner to this part of the work as most weighty.

The treatment and the management of eczema is, of course, most interesting, and receives full justice at Dr. Bulkley's hands. Purgatives and

diuretics in the acute stages, tonics in the more chronic conditions of the disease, are the main stay. Dr. Bulkley does not favour the use of enemata in constipation accompanying eczema, nor does he have much faith in "pouring water into the other end of the intestinal tube," as he terms the administration of mineral waters. In regard to this latter point, we are constrained to differ from him, as an extensive experience has brought us to the belief that mineral waters form an important adjuvant to the treatment of eczema in many cases. Arsenic is given a very subordinate place in the treatment of eczema, but not more so than the general consent of dermatologists assigns to it.

Not much can be done directly by internal medication to ease the itching which is so prominent a symptom of eczema. Morphia and opium, which are sometimes given, tend in reality to increase the existent pruritus. Chloral and bromide of potassium, alone or combined, are often of the greatest service for temporary relief, but should be used cautiously, as their depressant action harms the patient in the end. Aconite may be added to them with good effect at times. Gelsemium is recommended for the same purpose by Dr. Bulkley, but this dangerous remedy has failed to find favour among dermatologists, and our personal experience has not been favourable as to its good effects.

Proceeding to the discussion of the local treatment of eczema, Dr. Bulkley begins by giving some general principles of treatment, and continues in the discussion of the individual remedies which are enumerated in considerable number, at this point and at greater length in the discussion of eczema as found in various localities.

The chapter on the management of infantile eczema is of the highest interest and importance, while that on diet and hygiene cannot be too highly recommended.

In concluding this notice, we must congratulate Dr. Bulkley on the success which has attended the publication of his work, and which is merited by its high practical value. The dissemination of the views contained in this book cannot but result in the improved treatment of this the commonest of all skin diseases and often most distressing affection.

A. V. H.

ART. XXXIII.—*A Text-Book of Pathological Anatomy and Pathogenesis.* By ERNST ZIEGLER, Professor of Pathological Anatomy in the University of Tübingen. Translated and Edited for English Students, by DONALD MACALISTER, M.A., M.B., Member of the Royal College of Physicians, Fellow and Medical Lecturer of St. John's College, Cambridge. Part II. Special Pathological Anatomy; Sections I.–VIII. London: Macmillan & Co., 1884, pp. 371.

THE favourable opinion expressed when the first volume of Dr. Ziegler's Text-Book was reviewed last year, is amply justified by the contents of this present further instalment of his work. In it we welcome the same diligent, laborious, and exhaustive study of every department of the subject-matter, the same faithful and impartial record of what other conscientious workers have accomplished in each field, the same lucid but concise exposition of our best knowledge respecting each detail of

pathogenesis, and its practical results in the human organism, and from Dr. MacAllister the same accurate yet elegant translation, which won our esteem for both author and translator on a former occasion.

Owing to the very rapid sale of two editions of the book in Germany, the author was compelled to give to the preparation of a third edition of the earlier parts, that time which he intended to devote to the completion of the work. Hence the translator is obliged to furnish this portion alone, reserving his version of the sections on the kidney, the lungs, and the nervous system, for another volume, of about the same size, to be issued next year.

In preparing his English edition, Dr. MacAllister has had the invaluable aid of Professors Klein and Greenfield, who have read and commented on each sheet as it passed through the press, and Dr. Thin has in like manner advised with him in regard to the chapters upon the skin. He therefore hopes that little in recent pathology has been overlooked, which is likely to be of use to English students.

The first section is devoted to the blood and lymph, and starting with the fact that the blood is a definite living tissue, and that we may consequently have a localized death or necrosis of the vital fluid, he proceeds to consider such circumscribed death under the aspects of thrombosis and embolism. The subject of organization of thrombi is very fully explained and illustrated by wood-cuts, which, like most of those which so liberally adorn the pages of the volume, are of unusual excellence. In the interesting chapter on the changes in the blood corpuscles, leukæmia is carefully considered, and the statement made that it is impossible to assign definitely the parts sustained by different organs in its production. In particular it seems questionable whether the bone-marrow takes the important share ascribed to it by Bizzozero, Neumann, and others, at all. The ultimate cause of leukæmia is admitted to be still unknown, and it may possibly prove to be an infective disorder, as suggested by Klebs. Attention is called to the interesting researches of Ehrlich, upon the behaviour of the white blood cells with various staining fluids, and especially the circumstance that in cases of chronic leukæmia certain of these corpuscles, which have a notable power of absorbing eosin, are increased in number. This ingenious application of Koch's well-known staining methods to the diagnosis of true leukæmia may prove of great value, but the fate of Beale's hasty generalization, in regard to every ingredient of a cell which was stained by carmine being therefore germinal matter, suggests that the name of "Eosinophilous cells" applied to these elements, should be cautiously adopted into our nomenclature. The production in extreme anæmia of Mycrocythæmia and Poikilocytosis, so important in a medico-legal aspect, are attributed both to defective production and abnormal and excessive destruction of the corpuscles, the latter being probably the chief factor. In the interesting discussion of Progressive Pernicious Anæmia, many Continental and a few English authorities are cited, but the elaborate essay of Professor Pepper, published in this journal some years since, appears to have been entirely overlooked.

Section II. is devoted to the vascular mechanism, the first chapter treating of malformation and malpositions of the heart; the second, atrophy and degeneration of the heart, and so on through the long list of cardiac affections. The wood-cuts illustrating myocarditis and endocarditis with the accompanying text are particularly satisfactory.

In the third section on the spleen and the lymphatic glands the structure and function of that physiological problem, the spleen, are considered. There is little question, of course, that this organ is the grave of the red blood corpuscles, and, according to Quincke and Kunkel, a part of the iron which the globules contain is utilized in the formation of new ones, whilst another part goes to the liver for elimination. Recent investigations have thrown doubt on the formerly accepted theory that red corpuscles are manufactured in the spleen itself. Although Neumann still advocates this older view, Tizzoni opposes it, and Bizzozero, whilst admitting that after serious hemorrhage the spleen may for a time produce new red globules, denies that under normal conditions these elements are manufactured in the spleen after intra-uterine life terminates.

In the important section on the serous membranes, Prof. Ziegler adopts the new view of Hertwigs and Balfour, that the pleuro-peritoneal cavity is derived from the primitive alimentary cavity, and is not a mere lymph-space, constituting the first rudiment of a vascular system, as originally taught by Haeckel and accepted by Ziegler in the first German edition of this text-book. This account of the origin of the vertebrate body-cavity has a pathological as well as an embryological bearing, for if its covering is epithelial instead of endothelial in its primary origin, its pathological affinities will be more with those of the mucous membranes, than with the morbid changes of the vascular and lymphatic systems. Our knowledge of the inflammations of serous membranes is declared to be, thanks to Cohnheim and his followers, full and complete. But the same can scarcely be remarked in regard to our author's chapters upon tuberculosis, tumours, and parasites of these structures. These subjects are discussed in about five pages, and although care has been taken to exclude irrelevant matter, the impression of a consideration quite too meagre for questions of such grave importance as those here involved, is left upon the mind of an attentive reader.

Section fifth, treating of the skin, is very full, and gives evidence of a large amount of careful microscopic work. Some of the cuts illustrating the parasitic affections of the integument are particularly fine, as are also several we observed in the sixth section devoted to the mucous membranes.

In the seventh section, wherein is elaborately considered the alimentary tract, many readers will be interested in perusing a brief account of actinomycosis, now the subject of so much controversy in this country. This paragraph is illustrated by a copy of Dr. Sims Woodhead's picture of the supposed mycelium and conidia, from a nodule in the tongue of a cow. A correction is justly made, attributing the first recognition of the true nature of the disease in the human subject to Ponfick, who also originally demonstrated the genesis of the affection by his inoculation experiments.

The concluding section is appropriated to the liver and pancreas, the former being fully, and the latter quite briefly discussed. Among the comparatively novel doctrines advanced is that circumscribed hypertrophies or hyperplasias of the adult human liver tissue do occur, and citation is made of the recent investigations of Tizzoni and Colucci, which tend to show that in the lower animals at least, wounds of the liver are partly repaired by new formations of liver structure, and that these new formations may attain a considerable size. J. G. R.

ART XXXIV.—*On Sterility in Woman, being the Gulstonian Lectures delivered in the Royal College of Physicians in February*, 1883. By J. MATTHEWS DUNCAN, M.D., LL.D., F.R.Ss. L. & E. Philadelphia: P. Blakiston, Son & Co.

THIS handsomely printed work consists of three lectures, the subjects of these being, Nature and Amount, Theory or Causation, and Prevention and Cure.

Great difficulties beset the study of sterility in woman. The most important question to settle at the outset is whether the sterility is really that of the wife, or that of the husband. The statistics which Dr. S. W. Gross has collected in his well-known work, show very clearly that in many cases of childless marriages the husband is at fault. Again, in any large statistics showing the reproductiveness of a population, there must be many cases in which child-bearing is purposely avoided, sterility resulting from design, not from disease, so that the reproductive power is underrated by the sterility being apparent, not real.

Of course these lectures, as all that Dr. Duncan does, show great research, and painstaking investigation; he is not content with studying the subject of reproductiveness as shown in the human race, but studies it in inferior animals, and in the vegetable world. But the outcome of the studious research is that a true theory of sterility is lamentably incomplete. Dr. Duncan observes—"thousands of women are seeking what they call cure, and their advisers should surely know what they can offer in return for the confidence placed in them. According as medical men have their course illuminated by knowledge, so will they be wise in advising; and if increased knowledge, acting directly or by dispelling illusions, destroys faith in remedies, it may yet, in this negative way, add to the usefulness of the adviser. It has been said by Brodie of John Hunter that by teaching us when we are not to interfere with the ordinary course of events he has contributed more towards the advancement of the healing art than all the inventors of remedies who had gone before him."

Dr. Duncan states that "the chief and best demonstrated sources of, or attendants on, sterility are juvenility or prematurity, elderliness or post-maturity, dysmenorrhœa and disorders of sexual appetite and pleasure." Of these the influence of age is most fully shown; and his assertion is that a woman should not marry under, or over twenty-five.

He speaks quite disparagingly of the prevalent methods of curing sterility—remedying supposed or real strictures, versions or flexions of the uterus, which are regarded as preventing the ascension of the spermatozoa—and for the mechanical theory of sterility he shows little respect, indeed almost utter contempt.

Upon the whole this book, embodying many interesting and useful facts, and much acute reasoning, will be useful to the profession, though those who get it expecting to find out how to cure sterility will receive scant knowledge. T. P.

ART. XXXV.—*Asiatic Cholera: being a Report of an Outbreak of Epidemic Cholera in* 1876, *at a Camp near Murree, in India.* By CHARLES MOORE JESSOP, M.R.C.P., Associate of King's College, London; Brigade Surgeon H. M.'s British Forces. 8vo. pp. 47. London: H. K. Lewis, 1883.

THE appearance of Asiatic cholera in Egypt in 1883, and its possible invasion of Europe, have induced the author to select the occasion as opportune for the publication of a report of an outbreak of this disease in 1876, at a camp near Murree, in India, which came under his special observation. From the preface we learn that his main objects are, first, to furnish evidence in support of the statement that cholera was introduced into Camp Gharial by "infectious air," "cholera air," blown by wind direct from Topah, 1600 yards distant, and he therefore concludes that a cholera camp should never be placed to the windward of an inhabited locality. Secondly, to bring to the notice of the profession a new method of treating the consecutive fever, with the object of relieving cerebral congestion and obviating the tendency to death, which consists mainly in the employment of semi-reclination, or the sitting posture—a practice upon which he lays special stress.

The report opens with a minute description of the camp and all the circumstances connected with the outbreak of the disease. It is followed by a full description of the cases, which is interesting as illustrating the characteristic symptoms of cholera, and as exemplifying some of the predisposing causes, as improper diet, bad ventilation, depraved state of health, etc.; and, also, the results of the mode of treatment adopted. Special importance is attached to the method introduced by Dr. Hall, of administering chloral, hypodermically, to bring to an end the stage of collapse, aided by a practice which he considers indispensable, that of change of posture from the horizontal to the vertical position. Two grains of hydrate of chloral, in solution, were given every hour until improvement took place. As many as ten injections were sometimes necessary.

There were eighteen cases returned as cholera, twelve of whom died. Of the six who recovered, five were treated with chloral; and this practice was supplemented by keeping the patient's head elevated and the legs depressed. The author states as the *rationale* of this latter procedure that, in the stage of brain-congestion and collapse, "by favouring the powers of nature, in semi-reclination, increased action of the heart by a change of position is induced, the lower lobes of the lungs are given an opportunity of emptying themselves and their contents aërated [*sic*], to say nothing of the suction power of the heart in unloading the vessels of the brain." He asserts his belief, that the lives of these patients were saved by this procedure, and he urges its trial in analogous cases. In cases that appear to be hopeless, a resort to any rational expedient is justifiable; but it will require courage to adopt Dr. Jessop's view in departing from the practice of observing the recumbent position in cases of profound exhaustion, lest fatal syncope be the result.

Dr. Jessop believes the cholera was introduced into Camp Gharial by wind blowing direct from Topah, an infected camp, 1600 yards distant; and he attributes its spread to what has been called "the epidemic constitution of the year." His words are: "The epidemic constitution of the year must be blamed for propagating 'infectious air' introduced into

camp, blown by wind direct from Topah, 1600 yards distant," though he adds that it was further assisted, probably, by foul air carried in the pugrees of visitors from Murree. On page 31 he practically discards this latter view. At the present day we are hardly justified in attaching much etiological value to the theory that the contagion of cholera is spread to any great distances under certain states of the atmosphere and with certain winds.

Dr. Jessop has arrived at his conclusion by the method of exclusion only. We are not so sure that other commoner agencies of introducing the cholera germ have not been overlooked. There was direct and indirect communication with Murree, where cholera prevailed; and it is more consistent with our knowledge of the etiology of the disease to infer that it was introduced in the usual manner, though its detection may be involved in obscurity. Once introduced into camp, its propagation is not difficult to account for.

Dr. Jessop's report shows evidence of a painstaking effort to arrive at the truth, for which he is to be commended. His cases are interesting, especially in connection with the novel treatment he employed. In some places his reasoning lacks cogency; and his style, at times, is defective from want of clearness. We have noticed a few careless expressions and awkwardly constructed sentences. Barring these defects, the report is a praiseworthy attempt to make a record of an interesting experience, and merits a careful reading. W. H. F.

ART. XXXVI.—*Lectures on Diseases of the Nervous System*, delivered at Guy's Hospital. By SAMUEL WILKS, M.D., F.R.S. Second edition, 8vo. pp. x., 602. Philadelphia: P. Blakiston, Son & Co., 1883.

IN the present edition this work has been considerably enlarged, much of the matter has been rearranged, and the newer ideas of some of the recent French and German neurologists have been incorporated. It is a book both of ideas and experience. The author's psychological observations and discussions, whether about the relations of mind and brain, or about high foreheads and low morale, or about the mental or the moral treatment of hysteria, are always interesting and generally instructive. He shows a commendable knowledge of neurological literature, physiological and pathological, and happily applies this knowledge to the explanation of clinical phenomena.

The book is divided into four parts, devoted respectively to diseases of the brain and of the spinal cord, to general and functional diseases, and diseases of the nerves. The special subjects under these heads are treated of in an interesting but irregular manner. The book is not, nor does it claim to be, a systematic treatise on nervous diseases, like the works of Rosenthal, Hammond, or Ross, for instance. He who possesses the latter, or similar works, will find this volume of great value in furnishing new illustrations and numerous hints and suggestions of a practical character.

Poets, novelists, and philosophers are frequently called upon by Dr. Wilks, to give point or piquancy to his remarks. He has not only clothed the dry bones of neurological science with the flesh and blood of actual clinical and pathological experience, but he has added the pleasing adornments of general literature. C. K. M.

QUARTERLY SUMMARY

OF THE

IMPROVEMENTS AND DISCOVERIES

IN THE

MEDICAL SCIENCES.

ANATOMY AND PHYSIOLOGY.

The Alkaloids of Putrefaction.

H. Maas, in a paper on this subject in *Fortschritte der Medizin*, i. No. 15, gives the following as a convenient process for obtaining these alkaloids.

The putrefied masses, treated with alcohol, and with acetic acid until there is an acid reaction, are left alone, and stirred for several days. The alcohol is then removed by filtration, and the process is repeated. The alcoholic extract is finally reduced on a water-bath, and the acid aqueous solution is concentrated to the consistence of a syrup. By further treatment with alcohol, it is possible to obtain the acetates of the alkaloids of putrefaction in a state of purity, which give all the special reactions of the alkaloids. For experimentation on animals, the solutions of the alkaloid salts are concentrated to the consistence of strong bouillon; this preparation has a reddish-yellow colour, and a fleshy odour. Experimentation with the alkaloids on frogs quickly paralyzes them, and death soon follows; on warm-blooded animals the effects are similar to those of strychnia.

By treating this acid solution with ether, an alkaloid is isolated which has not yet been studied physiologically. By first adding soda, the ether develops two different alkaloids. One crystallizes in beautiful colourless transparent crystals, and evaporates on the platinum foil, giving off a strong odour of putrefaction. The other remains after distillation, under the form of an oily drop, giving, with hydrochloric acid, a crystalline salt extremely soluble in water. Its action on frogs is similar to that of morphine.

Amylic alcohol succeeds better than ether. The new alkaloid thus obtained, when transformed into a hydrochlorate, is extremely toxic, paralyzing the heart and decomposing the blood. A fourth alkaloid, obtained by treatment with chloroform, causes in frogs a set of symptoms similar to those produced by strychnine. 2030 grms. of putrefied muscles furnish 6 grms. of alkaloid by amylic alcohol, or 774 milligrms. by chloroform, or 22 centigrms. by ether.—*Gaz. Hebdom.*, April 11, 1884.

MATERIA MEDICA AND THERAPEUTICS.

The Modifications of Temperature in Febrile Diseases of Children by General Inunctions.

FOURCAULT having shown that the application of an impermeable varnish to the skin of an animal causes a lowered temperature, several physicians have attempted to make a practical application of this refrigerant effect in exanthematous diseases, using fatty matters, collodion, or traumaticine (gutta-percha) dissolved in alcohol. Schlemann and several German physicians, after different trials, have found that a fever seems most influenced by inunctions. Senator was the first to make experiments of a serious and practical nature on this subject, using the thermometer as a guide. These experiments showed that, in a healthy man, the application of fatty matters or varnish caused insignificant modifications of the temperature, but that in the febrile subject they diminished the temperature to a greater or less extent.

No experiments having been made on children, Dr. COLRAT, of Lyons, began to experiment with lard, cerate, and vaseline in the different acute affections of young subjects. In every case he obtained an abatement of the general temperature of the body. The thermometer, in the rectum, often showed a diminution of 1°.4 Fah., sometimes more, but rarely so much as 3°.6 Fah. The maximum abatement was attained in these experiments in about one hour after the inunction, and in two-and-a-half or three hours the temperature had risen again. Another inunction at this time gave the same results. Dr. Colrat's experiments were made on children of from one to two years of age. He had occasion, also, to use this method in the case of a child of three months and on another thirteen days old. In these cases the abatements of temperature were considerable. Under the influence of inunctions of vaseline the temperature fell 2°.8 Fah., and even 3°.6 Fah. That these frictions are entirely harmless has been conclusively demonstrated by Schlemann, who made inunctions on scarlet fever patients for more than four weeks at a time.—*Journal de Méd. de Paris*, March 8, 1884.

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Chinoline as a Febrifuge.

Chinoline is now used quite extensively in the medical clinic at the University of Upsala. In fevers of a determined type it is given at the period of maximum and minimum temperature; the same is true in secondary fevers, as the hectic fever of phthisis. It is given every third day at the same hour, so that the effect of one dose has passed off before the next is administered. In a small hospital, as that of the Upsala clinic, these experiments present a certain number of practical difficulties on account of the rarity of the cases. HENSCHEN has thus far reported on 18 cases of phthisis, 1 of chronic pneumonia, 1 of tuberculosis with tuberculous meningitis, 2 cases of uro-genital tuberculosis, 20 of typhoid fever, 1 of acute pneumonia, 4 cases of pleurisy, 1 of pleuro-pneumonia, and 1 of acute cystitis and cancerous peritonitis.

Tartrate of chinoline appears to have an energetic action in the hectic fever of phthisis, it acts equally well in typhoid fever, in some cases seeming to give it an abortive form. Henschen draws the following conclusions:—

1. Chinoline is indicated in fevers caused by infecting micro-organisms, such as the bacillus tuberculosis, or by local phlegmasiæ.

2. It is contra-indicated in gastric affections (particularly simple ulcer of the stomach) and in persons having a tendency to nausea and vomiting. Vomiting, under these circumstances, may be as dangerous as hæmoptysis (hæmatemesis or peritonitis).

3. Chinoline causes lowering of the temperature in most cases, with the phenomena of collapse, and without cardio-pulmonary troubles. Its action is often manifested in two hours, sometimes later; it persists for twelve or fourteen hours, and disappears after about twenty-four hours; sometimes, however, it is seen after thirty-six hours or longer. It does not act quickly, but its effects last for a long time. Defervescence does not appear to be proportional to the dose. In exceptional cases chinoline causes an elevation of temperature; this elevation commences in one or two hours and may attain a high degree. In six or eight hours the temperature falls below the initial point. This is seen after the administration of large doses, and is sometimes accompanied by *malaise* or rigors. There are also differences in it according to individuals.

4. Chinoline is given in the afternoon, after the febrile exacerbation, in doses of gr. vijss to xv; gr. xv have the same effect as the same quantity of quinine.

5. The principal advantage of chinoline is its relatively low price; furthermore, it does not cause nervous phenomena (headache and roaring in the ears) as do salicylic acid, quinine, or resorcine. Its principal disadvantage is that it causes nausea and vomiting. Certain patients take it well; others do not. It may be given per rectum, when it does not cause these symptoms. Sometimes it causes diarrhœa. When used with caution this drug is useful and active.—*Upsala lakaref. Fordhandl.*, Bs. 18, p. 466; *L'Abeille Méd.*, March 31, 1884.

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Resorcine.

This drug, belonging to the aromatic series in chemistry, to which carbolic acid, salicylic acid, and many other drugs also belong, was discovered, in 1860, by Hlassivetz and Barth, but has only recently come into use. It is a dioxydrylbenzol, and its formula, $C_6H_6O_2$, is nearly related to that of carbolic acid, C_6H_6O, which drug it also resembles in its physiological and medicinal properties. Resorcine is very soluble in water, 95 parts in 100, and less so in ether, alcohol, glycerine, and vaseline. The aqueous solution is neutral. It darkens on exposure to the air, is phosphorescent, and treated with perchloride of iron it gives a beautiful blue colour; or, if sulphate of soda has been previously added, a deep garnet.

Its physiological effects have been well described by Justus Andeer, Callias, Péradon, Brieger, Patella, and Guarta. It destroys the low organisms, causing certain fermentations and putrefactions. A solution of 1 to 100 arrests alcoholic fermentation. A solution of 2.5 to 100 stops lactic fermentation, and is a valuable preservative liquid for anatomical specimens. It is, therefore, an antifervescent and antiputrescent of great power. As regards the higher animals it has a certain degree of toxicity, but much less than carbolic or salicylic acid. According to Callias a toxic dose must exceed .90 per kilogramme (℔ijss) of the animal in order to cause death. Its poisonous effects, *resorcism*, is shown in peculiar convulsive or eclamptic attacks, somewhat similar in character to the effects produced by slight electric shocks. These attacks usually last for several hours. Resorcine, then, is a convulsant, not in the same sense as strychnine, but more eclamptic than tetanic, which is exactly what Paul Bert noticed with carbolic acid. In large doses the respiration is troubled, anxious and irregular, rapid at first and then slow. The circulation is accelerated, then slowed, and finally arrested. In rare cases it causes hæmaturia. The *post-mortem* lesions are not absolutely characteristic.

Justus Andeer and Péradon have experimented upon themselves, not only with small, but with large and dangerous doses. In doses of gr. xlv–lxxv a day, the drug only causes slight roaring in the ears, without other symptoms. ℈viij,

taken in twelve hours, produced dull pain in the head, with heaviness and loss of appetite. The same dose, taken in six hours, caused deafness, sighing respiration, vertigo, and lassitude, and modified neither the temperature nor the pulse. Taken in two hours it caused a deep sleep, followed by a normal wakening. Taken in fifteen minutes it caused troubles of sight, hearing, odour, and taste, followed by hallucinations. Péradon had the same experiences, with redness of the face, more or less profuse perspiration, and lowering of the temperature under large doses.

The therapeutic applications of resorcine are based on its antiseptic and antithermic properties, and it has been successfully used in certain infectious diseases. In typhoid fever it acts by combating the infective principles and the high temperature of the disease. But up to the present time its action in typhoid fever does not seem to have been very favourable; its action in reducing the temperature is insufficient, and it seems to have no other marked effect than that of diminishing the stools and ameliorating the condition of the alimentary canal.

In intermittent fever, on the contrary, its action seems to have fully justified the hopes of the experimenters, and Kahler regards it as quite equal to quinine. The cures of intermittent fever by resorcine may now be counted by the hundred, and the recent observations of Bassi, Rhigi, Lichtheim, Kahler, and others, leave no doubt as to its efficacy. Beside this effect on the temperature, it has the advantage that it may be administered at the beginning of the access of fever; in fact, this is the best time for administering it, as its effect is very evanescent. Lichtheim gives one large dose of gr. xlv.

In diphtheria, Justus Andeer uses resorcine in powder for making local applications. In severe cases he gives it internally. In 222 cases thus treated, he was not disappointed in a single one. In erysipelas it does not seem to have any marked effect except when injected hypodermatically along the erysipelatous line. In cholera infantum resorcine has been shown, by Totenhöfer, to have a very markedly good effect. It should be given in doses of gr. jss–x, in infusion of chamomile or some such mixture. (Its good effects in pertussis, as observed by Moncorvo, of Rio de Janeiro, have already been noticed in the *Amer. Journ. Med. Sci.*, Oct. 1883.)

External Uses.—On account of its antiseptic action, resorcine in solution may be used for dressing putrid or atonic wounds. It has the advantage over several other antiseptics of being odourless, though it is less astringent than carbolic acid. The solution is also useful as a topical application in syphilitic ulcerations; and, as shown by a recent pamphlet of Leblond and Fissiaux, it is as useful in the treatment of soft chancres as iodoform. It has been successfully used in a 6 to 100 solution in orchitis, in a 2 to 100 solution as an injection in acute and chronic gonorrhœa, in a 1.50 to 100 solution as an application in catarrhal conjunctivitis. According to Masini it has important uses in aural diseases; in ozœna, according to Massei; in umbilical blenorrhœa, according to Gatchkowsky; as an injection in vesical catarrh (Andeer); and in vaginitis. Dujardin-Beaumetz employs it in washing out the stomach.

Resorcine has no irritating action on mucous membranes. For internal administration it is preferably given in an aromatic solution, or in sweetened water to which an aromatic syrup is added. The doses vary according to individual circumstances. For external use the vehicle may be water, or water with glycerine and alcohol. It can also be incorporated in pomades, etc.—*Gaz. Hebdomadaire*, March 7, 1884.

The Bromides in Infantile Therapeutics.

In a clinical lecture on this subject, Dr. JULES SIMON says that the bromide of potassium was first employed as an anti-syphilitic remedy by Puche and Ricord. Lencock, Brown-Séquard, Gubler, and others have frequently recommended it in the treatment of neuroses, and especially in epilepsy. One may get an idea of the increase in the use of this drug from the records of the Paris hospitals. In 1855 seven pounds and a half were used, and in 1875 eighteen hundred and twenty-five pounds were used in these institutions.

What, in infantile therapeutics, is the method of using this drug? What nervous symptoms does it oppose? In order to answer these questions it is first necessary to know in what forms and doses the bromides should be employed. Of the alkaline bromides in general use, the bromides of potassium, sodium, and ammonium are the most common. The bromides of potassium and iron, and the bromhydrate of quinine are also used.

As regards doses, the following rules should be observed, according to the age of the patient. Infants less than one year old, gr. iij, in two doses at the time of nursing. More than one year, gr. vj, in two doses in syrup or powder at the time of eating, but always well diluted. More than two years, one may give grs. xv, xxx, or xlv until a marked physiological effect is produced. In some cases very large doses are required; in others increasing doses for five or ten days, then decreasing until it is suspended altogether. This method is very applicable to the treatment of epilepsy.

As to the physiological effects of bromide of potassium, it diminishes reflex sensibility of the mucous membrane of the pharynx and fauces. Small doses stimulate the gastric mucous membrane and increase the appetite; large doses irritate the stomach and may cause intense gastralgia. After being absorbed, the bromide of potassium slows and regulates the heart's action. It is not so dangerous as digitalis, but it cannot be given indefinitely in cardiac affections. As soon as the effect is obtained its administration should be suspended. The continued use of it enfeebles the muscular system and the genital organs. The bromine compounds are eliminated by the respiratory organs and the glands of the skin.

The bromides are indicated in eclamptic manifestations and cerebral irritability. In epilepsy, progressively increasing doses should be given for several days, and then gradually diminished. It is necessary to keep up the administration of it for a long time after the attacks have ceased, beginning it for fifteen days in every month. The combination of the bromide with the iodide is especially indicated in epileptic attacks symptomatic of cerebral lesions. Bromide of potassium is also indicated in certain morbid symptoms of adolescence, as cephalalgia and cardiac irritation.—*Journ. de Méd. de Paris*, March 29, 1884.

Opium Smoking as a Therapeutic Means.

At the twelfth German Medical Congress, Dr. Thudicum made an interesting communication on this subject.

The apparatus which he uses is very similar to a tobacco pipe, with the exception that the bowl only has a very slight excavation for containing the drug. The opium should be in the form of the aqueous extract, and is preferably prepared according to the Austrian Pharmacopœia. The method of using it is as follows: A small quantity of the extract is placed upon the border of the pipe. Then a small quantity is taken upon a needle and held into the flame of a spirit lamp until all the water has evaporated and the mass is reduced to the consistence

of pitch; it is then placed in the bowl of the pipe and the needle is withdrawn, after having been thrust entirely through it so as to make an opening for the entrance of air.

In making suction through the pipe-stem, the end of it should not be placed in the mouth, but only between the lips; then, by a series of deep inspirations, the fumes are drawn into the lungs. The piece of opium placed in the pipe should not burn brightly or be carbonized. If the little hole becomes stopped up the needle should be again thrust through it. The patient may smoke until the desired effect is produced.

According to Thudicum, opium smoking gives excellent results in a large number of affections. It rapidly cures a violent case of coryza, causing an almost immediate cessation of cough, and has a very calming effect in phthisical cough. In chronic coryza, also, two or three pipes, smoked in the morning, will soon bring about a complete cure; and in hay fever it is an excellent remedy. The author has also seen most excellent results in chronic neuralgia and migraine, which had stubbornly resisted large doses of quinine. Long-standing migraine may be cured in three or four months if the patient will persist in the treatment. Certain cases of hyperæsthesia, which sometimes lead to insanity, are also cured by this method.

Of a large number of cases treated by Thudicum only one has acquired the habit of opium-smoking, so that the method by no means tends to produce the objectionable habit. A person may smoke for a long time and no inconveniences result other than a little digestive trouble. But on the other hand, care must be taken that the patient smokes a sufficient quantity, as opium, in small doses, is a tonic and stimulant.—*Centralbl. f. d. Gesammt. Thir.*, December, 1883.

MEDICINE.

Thallium in Syphilis.

Professor POZZI, has been for some time experimenting at the Lourcine Hospital with thallium in the treatment of syphilis. It was first used by Dr. Rabuteau.

Introduced into the system as a salt, thallium seems to be easily eliminated, a large part of it passing out by the urine. In its action it is somewhat similar to mercury, and is distinguished from lead by the ease with which the system eliminates it. Thallium is very active, more toxic than mercury, but more easily eliminated. It therefore has excellent qualities for producing an effect in a certain time. In two patients who took pills of thallium, Pozzi observed, at different times, violent pains in the epigastrium, and vomiting. Several patients complained of their gums, which were slightly tumefied. The facts are not yet sufficiently determined to enable one to draw definite conclusions as to the physiological action of iodide of thallium, but attention is called to the following points: 1. Iodide of thallium is an alterative. 2. It causes some amelioration in the state of vulvar syphilides. 3. That it gets into the system is proved by the state of the gums and its presence in the urine. 4. Thallium gives good results in the secondary accidents of syphilis, but it must yet be determined whether a rational treatment with it will cause a permanent amelioration, and whether tertiary symptoms are retarded or lessened by it.—*Revue de Thérap.*, May 15, 1884.

Treatment of Diabetes with Air-Douches.

M. Campardon recently read a note on this subject before the Société de Thérapeutique. He said that for a long time physicians have attempted, in the treatment of diabetes, to increase the activity of the cutaneous functions either by hydrotherapy or sudation. Some time ago he determined to use Dupont's apparatus for air-douches, and he has treated three patients in this manner. The first patient, a polysarcous woman, came to a complete menopause after a first series of eight douches of five minutes each directed upon the back and chest, and the quantity of sugar decreased from 77.44 grms. to 33.53 grms. She stopped the bromide of potassium which she had been taking for some months. After a second series of eight douches, the quantity of sugar increased to 63 grms.; but the patient felt much better, and did not pass more than three pints of urine in twenty-four hours, whereas she had previously passed six pints. In a second case, that of a woman, the quantity of sugar fell from 18 to 20 grms. after the first eight douches. She was then placed on bromide of potassium and chloral hydrate. The third case was that of an arthritic man who passed daily more than six pints of urine, containing 102 grms. of sugar. After eight douches he passed only three pints, the proportion of sugar fell to 68 grms., and his general health was very much improved.

Under the influence of the air-douche, the skin at the point upon which the douche plays becomes blanched, and is depressed to a considerable extent; the local temperature falls to 32° Fah. Afterwards the skin becomes reddened, congested, and moist for three or four hours. M. Campardon thinks that the shock produced by the column of air causes a sort of cutaneous massage, and an excitation of nerve filaments which is transmitted to the nerve centres, and thence reflected along the nerves of vegetable life; so that the douche causes greater circulatory activity in the capillaries of the integuments. In all the reported cases, the patients after the douche had a sensation of well-being and a desire for exercise. This procedure seems, therefore, to merit an extensive trial, so that further cases may confirm Campardon's results, or show that the method has no therapeutic value.—*Revue de Thérap.*, May 15, 1884.

Resorcine in Entero-colitis of Infants.

Mr. Carreras publishes, in the *Gaceta Med. Catalana*, the result of his experiments with resorcine in the choleric form, intestinal catarrh, and in entero-colitis of infants. The results in the first affection were not good, but were satisfactory in the second. Of eleven cases treated in this manner, the youngest was nine months, and the oldest four years old. Three were fed artificially, of which one died. The other ten presented symptoms of subacute entero-colitis. The treatment consisted in placing the children in the most favourable hygienic circumstances, and in dieting them. Resorcine was administered according to the following formula:—

℞.—Syrup of orange, f ℥j.
Resorcine, gr. ij–vij.
Citronella water, q. s. ad f ℥iv.—M.

S.—Three teaspoonfuls every three hours.

When the child is fed exclusively upon milk the dejecta may be very acid In this case some such mixture should be given as:—

℞.—Phosphate of subnitrate of bismuth, gr. xxx.
Bicarbonate of soda, gr. xv.
Pepsine, gr. vij.
Dover's powder, gr. j-iv.—M.

Make powders No. viii.

S.—One every hour or two.—*Progrès Méd.*, April 5, 1884.

Enteritis in Inherited Syphilis.

This paper is based on observations made by MRACEK at the Pathological Institute of Prof. Kundrat in Vienna (*Viertelj. für Derm. und Syph.*, Heft 2, 1883). Syphilitic affections of both ends of the alimentary canal have long been recognized, but their occurrence in the small intestine has been doubted. In acquired syphilis in adults, such lesions are excessively rare. In children with the inherited form of disease they are more common, but not so frequent as Birch-Hirschfeld's observations (five cases of intestinal lesion in forty of syphilis) would seem to show. In a series of about two hundred examinations, made up of children who themselves bore marks of syphilis, and of still-born children of syphilitic mothers, Mracek found ten cases of syphilitic disease of the intestines. In the present paper six of these cases are related in detail, and some others of a similar nature are referred to. From these cases it appears that syphilitic disease of the intestine occurs in two forms: (1) as a diffused inflammatory process extending over the whole or large areas of the gut, or (2) as circumscribed nodules limited to certain portions of the intestine In the first form, the infiltrated patches, in the earliest stage, are only distinguished from the normal tissue by their rigidity and pale yellow colour. In a more advanced stage, the infiltrations which occupy Peyer's patches have a pitted or dimpled appearance, and stand out clearly from the surrounding parts. The circumscribed nodules are almost always limited to the small intestine. Rarely is the stomach or large intestine affected. They are most frequently found in the upper part of the jejunum; not in the lower part of the ileum, which is often the seat of other morbid changes. The nodules are scattered irregularly over the gut, and vary from the size of a millet-seed to that of a lentil. They are situated chiefly in the deeper part of the submucous tissue, or between the muscular layers, or in the circular fibres. From the outside they appear as yellowish spots; from within they are distinguished by the reddened mucous membrane which covers them. Over the largest nodules the mucous membrane is mostly rigid and smooth, but never dimpled or pitted as in the infiltrated form of growth. The nodules grow towards the serous surfaces, which in the end become congested and thickened. Sometimes also the intestines become adherent to each other or to the abdominal walls. The nodules also tend to degenerate and break down. Both forms consist essentially of a small-celled growth of the intestine wall, but the infiltrated variety attacks especially the gland structures, particularly Peyer's patches. The nodules are scattered irregularly in roundish groups. The change begins as an infiltration of the adventitia of the smaller arteries; in the infiltrated form it originates in the vessels which surround the patch; in the nodular form it begins in the central vessels. The arteries become thickened, narrowed, and finally blocked, the result of which is degeneration of the new growth. The capillaries usually remain unaffected or are simply widened. At a later period the veins undergo a change similar to that of the arteries, but to a less degree. The lymphatics, especially those between the muscular layers and beneath the serous coat, also participate in the change to a slight extent. In two cases, both eight months' fœtuses, perforation of the gut had occurred, with consequent purulent peritonitis. These cases show that the change may occur rapidly *in utero*. Intestinal lesions have not yet been found before the seventh month of intra-uterine life. Besides the changes in the intestine, the meconium was also found to be thick and tenacious in several cases. In one case, no meconium was discharged for over fifteen hours. The syphilitic growth may also lead to irregular narrowing of the lumen of the intestine by the inward projection of the nodules; but the author has never seen the ring-like strictures

described by Oser. The mesenteric glands were always enlarged and infiltrated. In no case was the intestine alone affected by syphilis. There were constantly disease of the liver and spleen, and osteochondritis. Often also, in the most severe instances, there were changes in other organs —*e.g.* the lungs, brain, or kidneys, as well as different kinds of disease of the bones. To the paper is appended a series of drawings showing the most marked histological changes found in the cases which were examined by the author, and also a list of authors who have written on the subject of syphilis of the intestines.—*London Med. Record*, Feb. 1884.

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Gangrene of one Lung, and Lung Cavities treated by Drainage.

At a late meeting of the Royal Medical and Chirurgical Society two very important papers were read, in which the operative treatment of pulmonary disease was considered.

Dr. CAYLEY read a paper in conjunction with Mr. Pearce Gould on Gangrene of the Lung treated by Drainage, with Recovery. The patient was a girl aged twelve, who was admitted into the Middlesex Hospital on Jan. 18th. Four years ago she had had scarlet fever, which was followed by otorrhœa. On admission there was an acute abscess over the mastoid process on the left side, and extensive denudation of the bone about the external auditory meatus. The abscess was opened, and Mr. Gould, after trephining the mastoid process, gouged away some soft necrosed bone from the interior of the temporal bone. The patient progressed favourably till Jan. 28th, when symptoms of pyæmia developed. She had repeated rigors, with high fever of a strongly remittent type. On Feb. 2d signs of pleurisy with consolidation at the base of the right lung appeared. On the 7th her breath became offensive, and she began to spit up small quantities of stinking pus. On the 16th, these symptoms having continued, and the child having become extremely emaciated and prostrate, it was decided to drain the gangrenous cavity. There was now dulness over the right base as high as the angle of the scapula, and at one point some bubbling crepitation. Mr. Gould accordingly punctured the lung with a large-sized trocar and canula, and introduced through the latter a drainage-tube. Stinking pus and a sequestrum of gangrenous lung were discharged through the tube. The child rapidly improved, and was discharged on March 27th.

Dr. CECIL Y. BISS read a paper on the Treatment of Pus-secreting Basic Cavities of the Lung by the Method of Paracentesis and Free Drainage. The author groups pus-secreting basic lung cavities under three heads: (1) Those in which paracentesis is imperatively called for; (2) those in which it is unjustifiable; and (3) those in which it is a question of special difficulty whether it should be performed or not. A case was then related illustrative of the last group. A man aged thirty-two, with a satisfactory family history, and who had not suffered from any previous pulmonary disease, had been affected with cough and profuse expectoration for six months. On admission to hospital he presented at the right posterior base dulness, reaching as far as the spine of the scapula, with absence of breath-sounds and vocal fremitus. The heart's apex beat was half an inch outside the nipple-line. The case was regarded as one of abscess at the base of the lung, with slight effusion into the adjacent pleura. An exploratory puncture failed, however, to detect any fluid. Soon afterwards obscure friction sounds developed over the dull area, and then loud cavernous respiration with intensified voice sounds, the pyrexia and hectic symptoms becoming more marked. About a fortnight later—medicinal means having failed to give relief—a second exploratory puncture was made with negative results, except that the lung was

judged to be adherent. The course of the case continuing unsatisfactory paracentesis was resolved on. Professor Marshall made an incision two inches long along the tenth intercostal space, over the point of maximum intensity of the cavernous sounds, reaching and exposing the pleura; a trocar was then gradually inserted to a depth of four inches, when a cavity was entered, from which whiffs of fetid air were expelled, and a scanty blood-stained discharge flowed. The wound and cavity were temporarily plugged to stanch hemorrhage, and next day a drainage-tube was inserted, through which a puriform discharge began freely to escape. The symptoms were considerably, but not wholly, relieved. Ten days later signs of cerebral abscess appeared, and in another ten days the patient sank. The autopsy revealed a number of bronchiectatic cavities in the right lung, one of the largest of which had been pierced and drained by the operation. The lung was invaded by fibroid change, and much contracted. Two abscesses had formed in the brain. The opposite lung and all the other organs were healthy. No miliary tubercle was perceived anywhere. The following diagnostic points were briefly discussed: (1) The brief history of disease in comparison with the apparently long-standing morbid conditions; (2) the displacement of the cardiac apex; (3) the remarkable alterations which took place during the course of the case, in the auscultatory signs; (4) the invariable absence of tubercle bacilli from the sputa, and the inspissated secretions found after death in the lung cavities. In conclusion, the drawbacks and advantages of paracentesis of pulmonary cavities (apart from phthisis) were discussed, and a brief recapitulation of some of the literature of the subject was given.

Mr. GODLEE spoke of some of the difficulties with which the surgeon had to contend: first, those of the exact diagnosis of a cavity; and, secondly, the difficulty of ascertaining whether or not the pleura was adherent. Reference was made to cases which illustrated the two difficulties. A case of a child with two large cavities in the chest was referred to in which the pleura appeared to be adherent. With exploring needles some pus was obtained from the upper cavity. Excision of a portion of the fourth rib proved that adhesions were almost wholly wanting. Antiseptic precautions had been followed out. After some days a further operation was resorted to, but without any cavity being detected. Another case of a man under the care of Dr. Bastian at University Hospital, who seemed to have suffered from pleuro-pneumonia, was mentioned. An exploring needle was used, and after some trouble pus was discovered. However, here it was thought advisable to excise a portion of the rib, and then an irregular pulmonary cavity was tapped and freely drained. The man rapidly improved. With regard to instruments, a large canula with a blunt point, as used by Sir Joseph Fayrer in hepatic abscesses, was recommended; and a long trocar with a canula made of celluloid was shown; the celluloid tube might be made use of as a drainage-tube, being left in after being used as a canula.

Dr. KINGSTON FOWLER spoke of the case of a man aged forty-seven, of healthy family, who had seemingly taken into his air-passages a second left lower molar, which caused great dyspnœa, and failed to be ejected by emesis and inversion of the patient. When first seen there was expectoration of a considerable quantity of frothy mucus, as much as half a pint in the twenty-four hours. Emaciation was marked, and night-sweats had set in. At the right base the vocal fremitus was diminished, there was marked dulness, some friction was heard in the mid-axilla, and the physical signs indicated the presence of a cavity at the right base behind. An operation was performed, with strict antiseptic precautions, by Mr. Marshall; a trocar and canula were passed in, and an incision made down and outwards for an inch; some thick sanious matter was let out, and a cavity was detected, which was probably an en-

larged bronchus. The cavity was packed with strips of carbolized gauze, and after some days these were replaced by a drainage-tube. Later on he brought up eight ounces of muco-purulent sputum, and seemed slowly to improve. The drainage-tube was gradually shortened, and the wound ultimately nearly healed. There was still evidence, however, of a small cavity at the right base below the angle of the scapula. No evidence of disease elsewhere in the lungs was to be detected, and tubercle bacilli had not been found in any of the sputum examined.

Mr. WALSHAM related the case of a patient who had a phthisical cavity at the left apex; a small sinus appeared above the left nipple. The speaker followed the sinus upwards to the second intercostal space, laid open the cavity, and washed it out with a solution of carbolic acid. A slow but great improvement took place, increase of flesh was made, and the strength was wonderfully improved.

Dr. BROADBENT related the case of an officer who was the subject of a basic cavity. He had previously suffered from some lung mischief. There were evidences of a very large cavity at the base of the left lung; emaciation, night-sweats, and fever were slowly reducing the patient's strength. Mr. Edmund Owen was called in to lay the cavity freely open, with the result that some improvement took place. A second operation was thought to be necessary, but the physical signs rendered this unadvisable. A further flow of pus took place, and the patient seemed to be doing well, when he started off without permission to the south of France, where he subsequently died. Although the result of Dr. Biss's case was unfortunate, he was of opinion that as a pioneer in this new field of surgery the paper was of great importance.

Dr. DOUGLAS POWELL thought that the two papers which had been read illustrated the two classes of cases in which operative interference with the lung was properly called for. He considered that if a patient with bronchiectasis was slowly going to the bad from its effects there was nothing better to be done than to operate; operation drained away the residuum which the patient was unable to expectorate. In Dr. Cayley's case it was obvious that the cavity contained a "sequestrum of lung" and was a typical one for operation. Dr. Biss's case was probably one of fibrosis of the lung originating either in a chronic pneumonia or pleurisy and leading on to a "loculated cavitation" of the lung. The patient was suffering so severely from the fetid fermentation that surgery was decidedly called for. He regarded the absence of tubular or cavernous breathing as conclusive against the existence of a large cavity, but we might have many bronchiectatic spaces without such signs. No doubt these cavities opened into one another after a time, and so led to the seemingly sudden development of a large cavity with its accompanying physical signs. It was worth while to consider whether by passing a drainage-tube we might not create a centre of relief, round which cicatricial changes might take place greatly to the advantage of the patient by inducing healthy cicatrization of the rest of the diseased tissue. He said, in answer to Mr. Godlee's remarks, the physical signs of adhesion of the lung to the chest wall were practically *nil;* retraction of the intercostal spaces was insufficient to diagnose that condition.

Dr. BERNARD O'CONNOR asked Dr. Biss what were the signs of bronchiectasis, and whether alcohol had anything to do with the pulmonary condition.

Dr. CAYLEY, in reply, said that he thought it was safer to thrust a large-sized canula into the lung, rather than make a free incision. He considered that the operation was quite acquitted of having anything to do with the abscess of the brain in Dr. Biss's case.

Mr. PEARCE GOULD, in reply, said he was to be considered fortunate in hav-

ing struck the cavity the first time, for on introducing a second trocar by the side of the first he failed to reach the cavity; in this respect he concurred with Mr. Godlee's remarks. Richter had foretold that surgical aid would be employed for abscesses of the lung, and that only in cases which were not tubercular and the general constitutional state of the patient not far undermined. It was extremely desirable that the two layers of the pleura should be adherent, but Krönlein had recently removed a sarcomatous tumour growing from the sixth left rib, and made a free opening into the pleural sac, and although there was severe dyspnœa at the time, and a tumour as large as a walnut was excised from the lung, the patient made a complete recovery. It was perhaps not a matter of vital importance whether the pleural surfaces were adherent.

Dr. BISS, in reply, considered that the diagnosis of the exact situation of the cavity had a parallel case in abscesses of the liver. Paracentesis of the lung was perhaps not so simple an operation as might have been concluded. Mr. Godlee had narrated a case in which the physical signs conclusively showed the existence of cavities. Extremely fine trocars only had been used, and there were many conditions which might explain the want of surgical success in finding the cavities. In answer to Dr. Broadbent, he thought that the patient must have died whether operated upon or not, though no doubt death was accelerated by surgical interference. Further, three cases of bronchiectasis had been narrated, in which cerebral abscesses had appeared, and in one of these no operation had been performed. He did not think Dr. O'Connor's question a practical one, as operation ought to be performed whatever the nature of the basic cavity. Alcohol had nothing to do with the case in question.—*Lancet*, May 31, 1884.

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Floating Liver.

Dr. J. B. ARINI describes an interesting case of floating liver in the last number of the *Anales del Cerculo Medico Argentino*. The patient was a young married lady, in whom the abdominal muscles were weak and flaccid after child-bearing. Wishing to put on a new dress which was found to be too tight, she, with the aid of another person, forcibly squeezed herself into it by lacing her stays extremely tightly. Thus compressed, she started for church, but, before arriving there, was suddenly seized with an internal pain and sensation of tearing, which caused her to faint. Symptoms of peritonitis followed, obliging her to remain in bed for some time. On the subsidence of the peritonitis, a large swelling was noticed in the middle and right side of the abdomen. This tumour, which was movable, caused her great pain on walking, and she could only sleep on the right side. Dr. Arini first saw her eighteen months after the accident; he then verified the presence of a tumour, presenting the character of the liver. The anterior surface was smooth and convex, and not painful to gentle pressure; its lower border was sharp with a notch, its upper border thick and smooth; the tumour was movable, and could be raised upwards and to the right under the false ribs; the normal dull zone in the right hypochondriac had given place to a clear tympanitic sound. The periodical changes observed in the tumour coinciding with digestion, its movability, the subjective phenomena of weight and traction, and the physical signs, added to the history of sudden onset, recent confinement, and pendulous abdomen, all made the diagnosis clear. The treatment consisted in the employment of a species of support or corset, with a concave metal plate well padded, on which the thin border of the liver rested; the organ by this means was held up more or less in its normal position. The patient found great relief from this support, and was able to walk and to lie on the left side without difficulty.—*London Med. Record*, April, 1884.

Xanthomatous Myoma developing into a Molluscum.

MM. Ernest Chambard and Gouilloud report a case of rare neoplasm of the skin, showing an example of the transformations which congenital tumours of the skin undergo.

The case was that of a man who had under the angle of the scapula a rounded tumour, hanging by a small pedicle, which very much resembled a molluscum. The consistence of the tumour was soft or waxy. It was perfectly indolent.

Examination of a perpendicular section, toward the centre of the tumour, showed that its texture was very similar to that of a molluscum. It seemed to be formed of connective tissue thrown out from a fibrous fascia. Three regions could be distinguished in the tumour: a central, or axial, composed of fibrous connective tissue, the fasciæ of which seemed to radiate from an axis toward different points of the periphery; and a second, middle or cortical, composed of connective tissue, but the fasciæ appeared to cross one another in every way; and a third, the peripheric or epidermic. Certain peculiarities may also be distinguished, which lead one to suppose that a new neoplasmic process has been added to the old, from which the molluscoid fibroma has originated.

It was in the middle or cortical zone that these peculiarities are encountered. In almost the whole thickness the connective tissue appears infiltrated or replaced by masses of cells. This zone is strewed, also, with small brilliant masses, having the appearance of fat.

Histological Examination.—1. *Central or axial zone.*—This, as already stated, is made up of fibrous fasciæ which seem to form the axis of the tumour and are lost in diverging toward the periphery. Between these fasciæ are interposed numerous lymphatic connective-tissue cells, numerous bloodvessels being seen between them; and, at many points, hæmatin granules. In some places the fibrous tissue was transformed into mucous tissue. So far its structure does not differ essentially from that of an ordinary molluscum; but more attentive examination shows, between the parallel or divergent fasciæ which constitute it, numerous muscular cells, perfectly isolated and sharply characterized; these cells are fusiform, extremely elongated, having an oblong nucleus at the centre, which is coloured blue by eosin-hematoxylin. This same substance colours their protoplasm a slightly brownish-red.

2. *Middle or cortical zone.*—This is divided into a deep and superficial layer. On the limits of the central zone and deep layer, the muscular cells become much more numerous. The fusiform cells which almost exclusively make up the deep layer, differ from those encountered in the fibrous axis of the tumour, in that they are shorter and longer; but every intermediate four between the one and the other is observed, and in certain parts of the preparation the so-called field of Cohnheim is clearly seen. It is in this region that the xanthomatous foci are seen. With a low power these foci appear as small fatty bodies. With a higher power they are seen as irregular lacunæ, at the level of which the fusiform cells have disappeared and are replaced by small brilliant white acicular bodies, much resembling fatty-acid crystals often encountered in atheromatous foci. They have no precise limit, and are diffused through the muscular cells, in the intervals of which many small rods are encountered.

In the opinion of the microscopists examining these bodies, they seemed to be foci of fatty degeneration analogous to that which affects the connective tissue cells in xanthoma. It was suggested that they might be some form of micro-organism, but their colour reactions did not at all correspond to those of any micro-organism.

3. *Peripheral zone.*—The epidermis covering the tumour presented nothing noteworthy except a slight œdema. A considerable number of the microbes, called by Koch sphærobacteria, were found in different parts of the tumour.—*Ann. de Dermat. et de Syphil.*, Nov. 1883.

The Paste Treatment of Inflammatory Skin Diseases, especially of Eczema.

Dr. P. G. UNNA, who has been largely instrumental in bringing into use the method of treating diseases of the skin by means of impermeable pastes, has recently given in the *Monatshefte für praktische Dermatologie*, Nos. 2 and 3, 1884, a very complete list of the preparations used in his practice.

Bolus Pastes (Bole Armeniac).—This is made of bolus alba (or clean kaolin) with vaseline and glycerine, in equal parts, or with olive, almond, or linseed oil, in the proportion of two to one, as ℞.—Boli albæ, parts 2; linseed oil, part 1.—M. The addition of more oil makes a liniment. In order to obtain a good paste for eczema it is necessary to add some liquor plumb. subacet. (or liquor alum. acet.) or oxide of zinc. ℞.—Boli albæ, 5 parts; linseed oil, 3 parts; liquor plumb. acet., 2 parts.—M. This proportion is easily handled. It should be remembered that the bolus and oil are always to be mixed first, before the lead or aluminium is added, since the bolus and alum make an insoluble mass. Instead of 5 parts of bolus, we may use 3 parts, and 2 of zinc oxide, as ℞.—Boli albæ, linseed oil (or glycerine), āā 30 parts; oxide of zinc and liq. plumb. subacet. āā 20 parts.—M. Make a paste. This is an excellent application for eczema. Instead of bolus earth, kaolin may be used, and instead of the bolus alba, the flava or the rubra may be used on the hands and face. The bolus pastes are valuable, not only for the treatment of all kinds of eczema, erythema, and intertrigo; but, on account of the fineness of the clay, also as a constituent for strongly oxidizing, reducing, or corrosive preparations.

Lead Pastes.—Unna makes a lead paste in the following manner: Take a quantity of litharge, and cook it with double its weight of vinegar, until the latter is completely evaporated, and the litharge is reduced to a damp paste. With this paste the skin is smeared. After a time the litharge dries, and must be cooked again with more vinegar. The following prescription will practically amount to the same thing: ℞.—Lithargyri subt. pulv., liquor plumb. subacet., āā 20; cerussæ, glycerin., āā 5.—M. This is a valuable remedy in eczema. Unna also uses the following: ℞.—Litharg. subt. pulv., 50; aceti, 80; coque usque ad consistentiam pastæ, et adde ol. lini (aut glycerin, aut ol. oliv.), 10.—M. As is readily perceived, the cooking of the litharge with vinegar costs but very little, and is specially applicable for poor patients.

Starch Pastes.—As a base for his medicated starch pastes Unna uses: ℞.—Amyli oryzæ, 3; glycerine, 2; aq. destill., 15.—M. Coque ad 15 parts. A valuable starch paste for eczema is: ℞.—Zinci oxyd., 50; acidi salicylici amyli oryzæ, 15; glycerin, 15; aq. destill., 75.—M. Coq. ad 140. A valuable formula for acne is: ℞.—Sulphur. præc., 40; calcar. carbon., 2; zinci oxyd., 20; amyli oryzæ, 15; glycerin., 20; aq. destill., 75.—M. Coq. ad 120 parts. For poor patients we may add four parts of glycerin and two of zinc white, and then cook the whole while stirring it. As the starch pastes are not so friable after drying as the lead, Unna often mixes them, as:—

℞.—Amyli oryzæ, 10;	℞.—Amyli oryzæ, 10;
Glycerini, 30;	Glycerini, 30;
Lithargyri, 30;	Lithargyri, 40;
Aceti, 60;	Aceti, 80;
Evapora ad 80.	Evapora ad 90.

The first formula makes a creamy paste; the second is more like putty.

Dextrine Pastes.—Dextrine has of late been gaining ground in dermatotherapy, nd makes a nice base, with glycerine, for medicated pastes. A good base is made of equal parts, by weight, of dextrine, glycerine, and water, cooked. A

good paste in eczema is: ℞.—Zinci oxydati, 40; dextrin., aq. destill., āā 20; glycerin., 40; flor. sulph., 2.—M. Make a paste. Another, a mixture of the lead and dextrine pastes is: ℞.—Litharg., 30; aceti, 50; coq. ad 50. Adde, dextrin., aquæ, glycerin., āā 15; antea cocta.—M. Make a paste. If the paste should become too hard when dry, a few drops of hot water may be added.

Gum Pastes.—Unna has recently used gum arabic as a base for medicated pastes, mixed with glycerine and some powder or other, using one part each of mucilage of acacia and glycerine, and two parts of powder. The following are examples of gum pastes:—

℞.—Zinc. oxyd., 40;
Hydrarg. præc. rubri, 2;
Muc. acac.,
Glycerin., āā 20.
M.—Make paste. Eczema of children.

℞.—Zinc. oxydati, 40;
Bals. peruv., 20;
Muc. acac.,
Glycerin., āā 30.
M.—Make a paste. Scabies.

℞.—Cretæ alb.,
Flor. sulph., āā 2;
Picis liquid., 8;
Amyli, 20;
Muc. acac.,
Glycerin., āā 15.

℞.—Zinci oxydat., 50;
Acid. salicyl.,
Acid. carbol., āā 2;
Mucil. acaciæ,
Glycerini, āā 25;
M.—Make a paste.

℞.—Sacchari alb.,
Zinc. oxydat.,
Mucil. acaciæ,
Glycerini, āā 5.
M.—For sore nipples.

℞.—Amyli, 25;
Acid. pyrogal., 5;
Mucil. acac.,
Glycerini, āā 15.
M.—Make a paste.

Lead is best used as acetate of lead alone, or mixed with dextrine paste. Oxide of zinc may be incorporated in bolus, lead, starch, dextrine, and gum pastes. Sulphur mixes well in starch, dextrine, and gum pastes, less so in bolus paste, and should not be used in lead pastes. Preparations of ichthyol mix well in all except the gum pastes; especially well in lead paste. Tar is a useful ingredient in all the different pastes. Naphthol, carbolic acid, chloral hydrate, and camphor mix well in all pastes. Salicylic acid mixes well with all pastes except the gum. Iodine and iodoform mix well in lead, bolus, and gum pastes, but not in starch and dextrine pastes. Sublimate, calomel, white and red precipitate incorporate well in all pastes. Chrysarobin and pyrogallic acid mix best in bolus and gum pastes. Animal, vegetable, and mineral fats, as well as soap, mix in slight quantities without injury to the pastes. Large quantities of these, as well as caustic alkalies, do not agree with the technical and therapeutic characters of the pastes.

SURGERY.

Extirpation of the Larynx.

Surgeon-Major K. McLeod reports the case of a native of Bengal, æt. 40 years, admitted to the hospital on September 13, 1883, suffering from aphonia and dyspnœa and a tumour of the pharynx implicating the larynx. His troubles commenced about a year before his admission, when he was attacked with sore-throat. A painful swelling was noticed at this time, which prevented the swal-

lowing of food; but in a few days a discharge of blood and matter took place, and the swelling and dysphagia disappeared. Some pain however remained, and in about two months he began to bring up small quantities of blood occasionally. A month after this he got an attack of fever, and at this period, about nine months before his admission, he lost his voice. He also began to experience shooting pain behind the right ear; this interfered with his sleep, and he resorted to opium, consuming habitually about three grains of the crude drug. He was under observation for a fortnight in the second physician's ward before his admission into the surgical ward. On admission he was found to suffer from complete loss of voice, being able to talk only in a hoarse whisper. He suffered from considerable difficulty in breathing, and was subject to violent spasmodic fits of cough, resulting in the expectoration of bloody mucus mixed with small quantities of pus. He could open his mouth wide, and on inspecting his pharynx a tumour could be seen on the right side of the faucial aperture, just below the tonsil. It was about the size of a walnut, very vascular, and papillated on the surface. It felt hard, and on introducing the finger the tumour was found to implicate the glottis, the right fold of which felt tuberculated and thickened. The epiglottis was apparently healthy, considerable thickening existed on the right side of the larynx as far down as the cricoid cartilage, but none on the left. The thyroid body was apparently healthy. The box of the larynx moved freely up and down during the act of deglutition, and could also be moved from side to side on the deep tissues of the neck. An enlarged and indurated gland was felt deep beneath the sterno-mastoid.

On Sept. 19th he was put under chloroform, and an incision was made in the middle line of the neck in front from below the chin to within half an inch of the inter-clavicular notch. The muscles were exposed and the sterno-hyoids and omo-hyoids pulled aside, the thyro-hyoids divided close to their thyroideal origin. The larynx was carefully isolated on both sides, and during this process some small vessels had to be tied. The thyroid gland looked healthy, and it was accordingly decided not to remove it. The windpipe was now divided through the cricoid cartilage, and the divided end pulled forwards by a stout double silken thread passed through its anterior margin. Breathing and chloroforming were henceforward carried on through the tracheal opening. Some embarrassment of respiration occurred at the moment of dividing the windpipe, owing to a little blood entering it; but this difficulty was very temporary. The larynx was then rapidly dissected off the pharynx by means of a pair of blunt-pointed scissors, its attachments to the hyoid, tongue, and fauces divided, and the organ removed with the epiglottis, which was thickening at the base. It was then found that the pharynx had undergone considerable infiltration, and that the right lobe of the thyroid was adherent to a mass of cancerous tissue lying to the right of the tube passing under the posterior pharyngeal wall. The mass also implicated the fauces on the right side as far up as the tonsil. The carotid artery could be felt pulsating just outside of this mass. A very careful and tedious dissection was necessary to remove this mass. Preliminary ligation of tissues likely to contain vessels was resorted to, and the scissors used to divide the parts as far beyond the limit of manifest disease as possible. Finally the chain of an écraseur was passed round the attachments of the mass, which was thus severed and taken away.

The indurated gland was then sought for, isolated and removed. A few bleeding points required tying, but the amount of blood lost was not large. The operation occupied about an hour and a half. Directions were given for carefully watching the patient, keeping the wound free of accumulated blood and secretions, and feeding him periodically with nutrient enemata and with milk and beef-tea alternately by means of an elastic catheter passed into the œsophagus.

No dressing was applied except a layer of carbolic gauze to prevent access of dust, etc. A tracheotomy tube to be used at feeding times, but not worn habitually. The tumour was examined after removal, with the following result. The interior of the larynx was healthy. The disease had grown from the pharynx, had involved the root of the epiglottis, and the right aryteno-epiglottidean fold, and spread along the whole surface of the right ala of the thyroid cartilage externally. The pharynx was extensively implicated on the right side, and the tissue lying between it, and the longus colli muscle as far down as the right lobe of the thyroid body, which was adherent to the mass. A microscopic examination of the tumour was made by Dr. D. D. Cunningham, with the following result: "Tissue of embryonic character, consisting in great part merely of fusiform cells, the cells extremely abundant, and in many cases polynucleated; forms various."

The patient never reacted well, and died on the fifth day after the operation. —*Lancet*, April 26, 1884.

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Certain Forms of Intestinal Obstruction that may follow Hernia.

At the meeting of the Harveian Society of London, on March 20th, a paper on this subject was read by Mr. F. TREVES. Although, after complete reduction of a strangulated hernia, and after recovery from the operation, as a rule, no further intestinal troubles might be expected, apart from such as depend upon fresh accidents to the rupture, certain forms of intestinal obstruction might follow after such reduction. 1. There might be stricture of the intestine, due to cicatrization after ulceration or sloughing of the mucous membrane, or to a form of contracting peritonitis. From collected cases, it would appear that neither the seat of the hernia, nor the duration of the strangulation, nor the nature of the operation, has certain or definite concern in the production of these strictures. 2. Obstruction might be due to adhesions. The herniated loop might become adherent to the parietal peritoneum, and cause occlusion by "kinking;" or the adhesions might lead to "bands." Omental bands were also common after certain herniæ. 3. Obstruction might be produced by the formation in the bowel of a rigid loop. Several examples of this form of obstruction were given, together with examples of a fistula bimucosa consequent upon injuries received by the strangulated bowel.

Mr. GANT said, with regard to the origin of stricture of the intestine and looped constriction as forms of intestinal obstruction resulting from hernia, that they were not subsequent conditions, but commenced from the time of operation, owing to the indentation often left upon the bowel at the seat of stricture, when the strangulated portion had been inadvertently returned into the abdomen in that condition. Hence the great importance of gently drawing down the gut, and of effacing the indentation by gentle manipulation before returning the part into the abdomen. If this constriction could not be thus relieved, the previous division of the stricture would only half complete the operation, and the prognosis would be proportionately unfavourable. After the reduction of enterocele without operation, it was more than probable that similar forms of intestinal obstruction originated in like manner; and this pathological explanation would indicate the propriety of resorting to operation to discover and release any such constriction, even when reduction could be effected by taxis, provided that the duration of the strangulation rendered it probable that plastic constriction might have supervened. If the bowel were then returned, the symptoms of strangulation would probably continue, or intestinal obstruction eventually result.—*British Med. Journ.*, April 5, 1884.

How soon after Infection do Epididymitis and Buboes appear?

Dr. S. UNTERBERGER, of St. Petersburgh, after extensive observations in the Semenowschen Military Hospital and the Krassnoselskischen Garde-Hospital, gives the following statistics:—

1. *Epididymitis after Infection.*—Among 172 cases of urethritis there were 111 acute, and 61 chronic cases; 68 out of the 111 acute cases were uncomplicated, more than one-half; of the 61 chronic cases, 11 were complicated by cystitis, lymphangitis dorsi penis, bubo, cavernitis, and epididymitis. In the 172 cases of urethritis, epididymitis occurred 65 times, and one-third of the gonorrhœa cases also had epididymitis. Epididymitis, with acute urethritis, occurred on the right side 12 times, on the left 9, on both sides 2; with chronic urethritis on the right side 23 times, left 16, both sides 3. It is thus seen that almost twice as many cases complicated chronic as acute urethritis, that the affection seems to occur more often on the right side, and but seldom on both sides. As to the time at which the epididymitis occurred. Unfortunately this was observed in only 40 cases:—

Week,	1	2	3	4	5	6	7	8	Month,	3	4	Total.
Epidid. dextr.	3	4	5	1	2	1	1	2		1	1	21
" sin.	2	3	1	5	1	–	–	1		1	–	14
" bilat.	1	1	1	1	–	–	1	–		–	–	5

It is seen that the greater number of cases, 24, occurred in the first four weeks.

As to treatment the cases were treated at the commencement of the attack by ice-bags to the affected part, and after a few days a Fricke's bandage or inunction with ung. cinerium or iodatum was used. In about one-half the cases iodide of potassium, grs. xxx in die, were used in the subacute stage. When inflammation occurred, the use of thick metallic bougies, two or three times a week, gave good results.

Buboes.—In 172 cases of urethritis buboes occurred four times, appeared in the 4th week in 1 case, and in the 3d week in 3 cases. Of 180 cases of syphilitic chancre there was only one bubo, which appeared in the 7th week, was opened in a week, and healed in one week. The greater number of buboes were found as complications of soft chancres. Of 300 cases of soft chancre, 77 were uncomplicated. These may be divided into non-performing—those disappearing without operative interference, and perforating buboes, which required incision:—

Week,	1	2	3	4	5	6	7	8	Total.
Bubon. non-perf. dextr.	11	3	5	1	–	2	–	1	23
" " sin.	8	1	1	–	–	–	–	–	10

Week,	1	2	3	4	5	6	7	8	Month,	3	5	6	Total.
Bubon. perf. dextr.	17	6	2	6	3	2	–	–		1	1	–	38
" " sin.	15	8	6	3	3	1	–	–		2	–	1	39

Buboes were bilateral in 18 cases.

The following table shows the time of appearance of all buboes:—

Week,	1	2	3	4	5	6	7	8	Month,	3	5	6	Total.
Bubon. dextr.	35	11	13	9	3	4	–	1		1	1	–	78
" sin.	31	12	11	5	3	1	–	1			3	–	68

The last three tables show that almost one-half of all the cases of soft chancre were complicated by bubo. In one-half of all the cases the buboes appeared in the first week.—*Monatshefte für prakt. Dermatol.*, April, 1884.

Treatment of Contracture of the Neck of the Bladder.

Dr. RIZAT, in the *Concours Médical*, reviews the treatment of this affection considered as a complication of blennorrhagia. The treatment is completely different in cases of contraction with complete retention, and contracture with complete retention. In complete retention we must abstain absolutely from diuretic treatment. If retention has only lasted for a short time, say four or five hours, the patient may be placed in a large bath and kept there for one or two hours, the temperature of the water being carefully watched. If this does not enable him to micturate, the catheter should be used at once. The catheter is carried in slowly and with great care, in order to ascertain if there is any stricture. If the canal is free, it may happen that the catheter will cause the spasmodic contraction to cease; if it does not, the catheter must be passed whenever there is a desire to empty the bladder. If there is a stricture, internal urethrotomy is advisable.

When there is retention with incontinence, the catheter should be immediately passed. But pressure should never be made on the abdominal walls to facilitate the flow of urine. The flow may be intermittent, but in a few minutes or a few seconds the urine will re-commence to flow until the bladder is completely emptied; the catheter is then withdrawn and the patient put to bed. If desired a bath may be given before putting the patient to bed, but usually he will prefer the bed after his sufferings. A cataplasm over the lower part of the abdomen will tend to make him more comfortable, or, what is preferable, a thick layer of wadding covered with some impermeable material. The rectum should be emptied by means of an enema and a saline administered the next morning.

Micturition is not always spontaneously established, and sometimes it is necessary to catheterize the patient for a few days; but local and general treatment will usually succeed in a few days. The deep portions of the urethral canal should be carefully watched, as the prostate and Cowper's glands are very liable to become inflamed.

Spasmodic contracture alone or with complete retention only requires baths, washings, and emollient drinks. It is not prudent to give diuretics, and the kidneys should not be imposed upon by large amounts of fluid. It is, as a rule, useless to catheterize the patient, though it may be necessary. In case he has had several anterior attacks of blennorrhagia, surgical intervention may be necessary.—*Revue de Thérap.*, April 1, 1884.

Epithelioma passed per Rectum.

At a meeting of the Société Anatomique, in July, 1883, M. Dejérine presented, for Dr. GALLARD, a tumour, about the size of an egg, passed in the stools, and formed of cylindrical epithelioma. It came from a man, 45 years of age, whose mother died of cancer of the stomach. This man had for several months shown symptoms of digestive troubles, and had diarrhœa alternating with constipation. There was a tumour in the hypogastric region; this disappeared suddenly, and passed out per rectum. After hardening in absolute alcohol, the sections, coloured by picro-carmine, showed that the tumour was composed of cylindrical epithelioma. The glandular layer was normal; in the submucous cellular tissue were numerous rounded or ovoid cavities, lined with cylindrical epithelium. The tumour was attached by a pedicle, which was very vascular, and made up of embryonic connective tissue and numerous small vessels. The other case has been reported to the Société Anatomique by Prof. Cornill. It is a very rare specimen.—*Progrès Méd.*, April 5, 1884.

Treatment of Cancer of the Rectum.

In a clinical lecture at the Necker Hospital, Professor TRÉLAT drew the following conclusions with regard to the treatment of cancer of the rectum :—

1. Cancers of the rectum should not be touched, unless they cause grave disorders. This rule should be positive, with the single exception that very small cancerous deposits may be removed from the lower part of the rectum and the margin of the anus.

2. In all other cases the treatment should be confined to complications and palliative operations. In giving these rules I am in accord with Prof. Verneuil.

3. As palliative operations, rectotomy may be done when the finger can be passed beyond the upper limit of the neoplasm. If the neoplasm is more extensive, the surgeon should abandon rectotomy, and work out a way of derivation; for by performing rectotomy in these cases, the surgeon is almost certain to injure the peritoneum. With the English surgeons, and Labbé and Tillaux, I am in favour of lumbar colotomy, because it is a simple operation, less dangerous, and affords a ready means of exit for the feces. Other surgeons prefer to make an inguinal anus; but there is risk of opening the small intestine, with all the attendant dangers and inconveniences.—*Revue de Thérap.*, May 15, 1884.

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Fractures of the Sternum and First Costal Cartilage.

At the meeting of the Pathological Society of London, on March 4th, 1884, Mr. ARBUTHNOT LANE read a paper on one way in which the sternum might be fractured. M. Maisonneuve had attributed fracture of the sternum to force transmitted from the shoulder to the sternum by the clavicle; whereas Mr. Rivington had contended that the action of the clavicle was in no way essential to fracture of the sternum, and regarded the first two ribs and cartilages as the means by which was transmitted to the sternum one of the forces which fractured or dislocated it, the other being conveyed along the lower ribs. He showed that, as the inner end of the clavicle was fixed by ligaments, if vertical pressure were applied to its outer extremity, a much greater force was exerted on the anterior extremity of the first rib by the shaft of the clavicle in contact. Mr. Lane next stated that the first cartilage was one inch and a half deep at its attachment to the manubrium, while the second cartilage was only five-eighths of an inch; so that, when one cartilage was depressed by the clavicle, it tended to cause the manubrium to rotate around an antero-posterior axis, and also affected the opposite cartilage. If the pressure exerted were very great, one or both first costal cartilages might be broken, together with the sternum, without there being any displacement of fragments. Or only one cartilage might be broken. If the cartilages were very elastic, and the sternum rigid, it alone might yield, as in an experiment he had made on the dead body. In this case, the manubrium was ossified to the gladiolus. A heavy blow was struck on the outer extremity of the clavicle (carefully padded, in order that it might not be fractured); a fracture of the sternum at a point which corresponded to the junction of the first and second pieces resulted, the fragments not having been displaced. In other cases, the ligaments binding down the inner extremity of the clavicle might give way, and dislocation upwards ensue. As exemplifying this last result, he showed a specimen from the museum of Guy's Hospital, in which the inner end of the clavicle had been dislocated upwards, and the ossified first costal cartilage was fractured on the same side. Its line of fracture was irregular, and not vertical, as in fracture of the ordinary elastic cartilage. The sternum was not fractured. Mr. Lane showed a specimen similar to one which he had shown at the Society last year. The first cartilages and sternum had sustained the same fractures, no other bones

in the body showing any sign of fracture. A case recorded by Dr. Bennett (*Dublin Quarterly Journal*) served also to illustrate his view. A heavy weight fell on a man, fracturing many bones. That which had fallen on the clavicles had fractured both first cartilages and the sternum at the junction of the first and second pieces. He believed that fracture of the sternum or cartilages, or of both, was not so very uncommon as the scanty literature on the subject would suggest; also that Maisonneuve had no clear idea how the clavicle transmitted force to the sternum, which it did only indirectly by pressure on the first rib and cartilage. M. Maisonneuve apparently arrived at this conclusion by observing the frequent concomitance of fracture of the scapula and clavicle with that of the sternum. The sternum and cartilages, when fractured by this means, would present very little sign during life, or at a period long after the injury, owing to the fractures remaining in apposition. It was very difficult to decide, in many ossified first cartilages, whether they had been fractured or not, as they frequently presented a very irregular outline, owing to abundant deposit of new bone, which might either be the result of fracture, or thrown up to support the joint formed in this situation.—*Brit. Med. Journ.*, March 8, 1884.

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Suture of the Olecranon for Simple Fracture.

Mr. W. P. Keall reports the case of a man, æt. 33 years, who had sustained a simple fracture of the olecranon, caused by a blow with a heavy iron bar, inflicted on the arm which was raised to protect his head. The fragments were separated more than an inch when the arm was straightened.

On the next day an incision about four inches long was made from the tip of the olecranon downwards, over the posterior aspect of the ulna, similar to the lower part of the incision for excision of the elbow-joint. The soft parts were cleared away for a small space from the posterior surface of the fragment, and a hole drilled through to the broken surface, avoiding the articular cartilage; through this a stout silver wire was passed from the outside inwards. The tissues were then in a like manner separated from the ulna, and another hole drilled in the same way, except that from the angle made by the two surfaces. The direction of this one had to be made more obliquely than the first; and in this he was more fortunate than Sir Joseph Lister was in the cases he describes, and of which he gives a wood-cut in the *British Medical Journal* for November 3d, 1883, therefore there was no need to adopt the very ingenious manœuvre carried out by him with the needle and gouge.

The joint, of which the articular cartilage, especially that covering the surface of the humerus, was plainly visible, was cleared of blood-clot and *débris* from the drilling of the bone; another wire was passed through this from without inwards, and the end of it between the two fragments of bone was passed through a loop formed at the internal end of the first wire, by which it was pulled out through the first hole. The two pieces of bone then being well pressed together, the two ends of the wire were drawn tight, twisted together, cut off, bent and hammered down on to and partially into the bone. A drainage tube having been inserted, the wound was stitched up and dressed with the protective and gauze in the usual manner.

The patient steadily improved, and in four weeks he could bend the joint to a right angle. In six weeks most of the movements of the elbow were almost perfect. He could extend it until almost straight, bend it to less than a right angle, could touch his head, and could pronate and supinate, and seven weeks after the operation he resumed his work.—*Bristol Medico-Chirurg. Journ.*, March, 1884.

Dislocation Backwards of the First Lumbar Vertebra.

At the meeting of the Clinical Society of London on March 28, Mr. N. DAVIES-COLLEY read a report of this case. A shipwright, æt. 55, was stooping at his work when a mass of iron, weighing 7 cwt., fell upon the small of his back. He was at once admitted into Guy's Hospital. He was collapsed, but quite sensible. The spine of the first lumbar was three-quarters to one inch behind that of the last dorsal vertebra. The adjacent spines were even and formed a continuous series, those above at a level considerably anterior to those below. There was no motility or crepitus to be detected upon gentle manipulation. He could move his legs, but the right somewhat less than the left. There was impairment of sensation on the outer side of the right leg, and complete loss upon the dorsum of the right foot. Soon after admission, extension was applied under ether. Mr. Davies-Colley kept his hand upon the prominence while three assistants made traction upon the legs. The projection was thus gradually reduced without any jerk; at the same time some crepitus and motility could be felt in the last dorsal spine. A plaster-of-Paris jacket, similar to the laminated form recommended by Mr. Furneaux Jordan, was applied in the horizontal position, while traction was still being made upon his legs. When he recovered consciousness he was quite comfortable. A more careful examination, two days later, showed that the right musculo-cutaneous nerve was completely paralyzed, and there was some loss of sensation between the first and second toes, where they are supplied by the anterior tibial nerve. For ten days he was unable to micturate, and some small bedsores formed over the sacrum, although within two days of the accident he could turn over in bed and lie upon his side. On the thirty-fourth day after the accident the splint was removed. The line of the spine was then quite even. There was no deformity, and little, if any, tenderness. In less than two months after the accident he was able to walk, but he was still unable to evert his right foot. With the help of faradization he gradually recovered power and sensation, and when he was last seen, in October, no difference could be detected between the movements of the two legs, and the only abnormality in sensation was a slight numbness in the middle third of the outer side of the right leg. Mr. THOMAS BRYANT said surgeons had hardly sufficiently recognized the form of practice which this case illustrated. The case of a man aged seventy-four, who fractured his spine from the fall of a sack of wheat on the nape of the neck, was mentioned. Paralysis of the lower extremities, priapism, pain down the right half of the body, marked projection of the third dorsal spinous process, fracture of the sternum, were the abnormal signs detected, and it was thought that fracture with displacement of the third dorsal vertebra had taken place. Extension and counter-extension were practised, a sudden click was heard and felt, and the patient was certainly relieved. On the third day anæsthesia and paraplegia were found to be complete. The patient, however, died on the seventh day, and the diagnosis was practically confirmed. Perhaps in a younger man the result might have been different.

Mr. ARTHUR DURHAM said he no longer looked upon spinal fracture as the hopeless cases he once did. With regard to the early application of a jacket of plaster-of-Paris, he considered that where anæsthesia was present and where there was a risk of bedsores following, it would be unwise to have resort to it. Later on it might be used with advantage.

Mr. DAVIES-COLLEY, in reply, said that the objection advanced to the plaster-of-Paris jacket could not hold good in his case for the reason that anæsthesia was not present in the back, and so there was but little danger from bedsores.—*Lancet*, April 12, 1884.

New Operation for Disarticulation of the Calcaneum.

Dr. Marcacci, in view of the difficulty of disarticulating the os calcis by Clifford's or Ollier's method, proposes the following: A vertical median incision is made at the lower portion of the tendo Achillis, so as to expose the posterior superior surface of the bone, is carried below the insertion of the tendon, and along the plantar aspect of the foot, and almost to the apophysis of the fifth metatarsal bone. The incision must be deep and down to the bone. From the anterior extremity of this incision, and at a right angle to it, a second incision is carried perpendicular to the junction of the external and middle third of the dorsum of the foot. This incision cuts the tendons of the lateral peronei, and is prolonged so as to include the tendons of the extensor communis. A third incision is now carried obliquely toward the tibio-tarsal articulation, along the external border of the neck of the astragalus. The surgeon then commences his dissection at the anterior incision, and carries it backwards, completing the operation by dividing the calcaneo-cuboidal ligaments, and such plantar, dorsal, and interosseal ligaments as may be in the way. The calcaneum may then be removed with a pair of strong forceps.—*O Correio Medico de Lisboa*, February 15, 1884.

Ulceration of the Carotid after Ligature.

On June 28, 1883, M. Polaillon presented to the Société Anatomique the report of the case of a man, æt. 65, upon whom he had operated for primary carcinoma of the tonsil. He was forced to ligate the common carotid just below its bifurcation. The wound healed well, with the exception of a small point, which suppurated, and even this was beginning to heal when the patient suddenly had a profuse hemorrhage from the mouth on the sixteenth day. Hæmostatics were used in vain, and the man died in two days.

The autopsy showed that the common carotid was sound. There was an atheromatous spot at the origin of the internal carotid. A minute examination showed that the catgut ligature was not absorbed, and that it included a small stump of sphacelated arterial tissue, and hanging by a small thread. The artery had ulcerated and ruptured at this point.—*Progrès Méd.*, April 5, 1884.

MIDWIFERY AND GYNÆCOLOGY.

Hydro- and Pyo-Salpinx.

At the meeting of the Medical Society of London, on April 28th, Dr. J. Kingston Fowler said that he had met with fifteen examples of these conditions in the *post-mortem* room of the Middlesex Hospital in the course of the last three years. In none of these cases had the condition of the tubes been suspected during life, and clinical details were not reported, partly for this reason, and partly because all the cases were complicated by some other general or uterine affection; in most of the cases, the record of the *post-mortem* appearances clearly indicated the course of the disease. The cases showed that the condition was a very dangerous one; many cases of peritonitis really due to this cause being set down to abscess of the ovary, pelvic cellulitis, or pelvic abscess. In eight of the fifteen cases, the condition of the tubes was the immediate cause of death; the disease was pyo-salpinx in all eight, and double in six. Of the eleven cases

of pyo-salpinx, death was due to peritonitis in seven. These conditions of the Fallopian tube might be set up by any inflammatory changes in the uterine mucous membrane, and probably in many cases the primary change was tubercular. In many cases there was an indurated spot close to the uterine end of the tube, which was completely closed at that point.

Dr. ANGEL MONEY has met with one case of pyo-salpinx in a child seven years old; this was the only one out of 250 necropsies.

Dr. PLAYFAIR said that it was a revelation to him to find that pyo-salpinx occurred with the frequency shown by Dr. Fowler's observations. Possibly the fact that so large a number of cases of cancer were treated in the Middlesex Hospital might in part explain the frequency with which the disease has been met with. The *via media* between the practice at Birmingham, and of those who believed that the operation should never be performed, was the safe course. He had operated four times, with one death. The diagnosis was exceedingly difficult, but the subject was one of great practical importance.

Dr. C. H. F. ROUTH advocated aspiration in place of oöphorectomy, which operation had this unfortunate result, that it unsexed the woman.

Dr. FOWLER said that in five of his cases cancer was present. He thought there was no question of unsexing, as the patients were certainly sterile.—*British Med. Journ.*, May 3, 1884.

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Corroding Ulcer of the Os Uteri.

At the meeting of the Obstetrical Society of London, on March 5th, Dr. JOHN WILLIAMS read a paper on this subject. He referred to the rarity of the disease, to the almost entire absence of descriptions of it in systematic treatises, and to the fact that its existence had been denied by some observers. It had been mistaken for cancer, and *vice versâ*. The histories of these cases, which had been under the author's observation for varying periods of time—one for two years and two for about ten years—were narrated, and the *post-mortem* appearances, together with the microscopical characters of the ulcer in one instance, were described. The differences between corroding ulcer—both clinical and anatomical—were pointed out, and the views of Sir Charles Clarke, that the disease was distinct from cancer, upheld. The disease began at the os uteri and extended along the vagina, involving its walls in a symmetrical manner. Its progress was slow, and two of the author's patients died of other diseases, while the third, which had been under observation for ten years, was still living. It was not necessarily associated with loss of flesh, and the pain and discharges were different from those usually met with in cancer of the uterus, and the edges of the ulcer were not hard and thickened. The mode of progress of the ulcer was in one case by means of reddish raised tubercles which became ulcerated, in another by slow ulceration without any preceding changes in the tissue about to be invaded, except some redness. The mucous surface to the edge of the ulcer appeared perfectly healthy. Microscopic examination showed this last observation to have been accurate, for the ulcer, its base and borders, presented no appearance except that of granulation-tissue. The case in which the disease presented the characters of lupus is still living. In the second case which died, and which presented the microscopic appearances mentioned, the ulcer appeared to be the result of a slow gangrene arising from calcification of the internal iliac arteries and their branches.

Dr. PRIESTLEY said that the rarity of the affection was proved by the fact that some gynæcologists in large practice were doubtful if they had ever seen a case, and that its pathology was much disputed. Thus, Kiwisch and Scanzoni regarded it as a variety of encephaloid cancer; Courty and West regarded it as a form of

epithelioma. He thought he had seen the characteristic form of the disease more than once. Sir Charles Clarke described the pain as burning, and not gnawing like that in cancer.

Dr. MATTHEWS DUNCAN said the disease had been the object of special study for many years to him, and he believed it to be of the nature of lupus. He was not sure that he had ever seen a case identical with those of Dr. Williams as to situation, but he had seen many in the lower vagina and external organs. Lupus of the external organs seemed to produce hypertrophies greater than any produced higher up in the passages. He had also seen the disease in the uterus.

Mr. WILLIAM DUNCAN thought Dr. Williams's cases were lupus, which had taken on an epitheliomatous nature.

Dr. GALABIN asked Dr. Williams whether he regarded the disease as having any analogy with rodent ulcer of the skin, which was now regarded as a form of rodent cancer. He had examined the uterus in Dr. Duncan's case, and found the deposit thickening the walls to consist of leucocytes, some of them having the suspicious character of being united by tailed processes.

Dr. ROUTH had seen two cases of the disease. There was no induration of surrounding parts, or fixation of the cervix. The absence of induration made him dissent from the view that it was lupus. Moreover, the ulcer never healed, as it does sometimes for a time in lupus. He suspected a scrofulous or syphilitic taint acting on ill-fed and weakly persons. Similar ulcers had been described by Samuel Cooper.

Dr. WILLIAMS replied that rodent ulcer was epithelioma starting from hair-follicles and sweat-glands, and corroding ulcer of the cervix could not be such. In one of his cases it appeared to be lupus. This patient was still living, therefore no microscopic examination had been made. The third case was, in his opinion, senile gangrene, depending on calcification of the internal iliac arteries and their branches on both sides. He had used the word "malignant" loosely as equivalent to incurable. He had seen one case of ulceration of the inner surface of the body of the uterus. The patient was over sixty years of age, had suffered long with offensive discharge, and was very fat. She died from other causes. At the necropsy the uterus was large, the walls thickened, the cavity large, secreting a quantity of broken-down dark material. Section of the walls showed nothing except the muscular fibres of the uterus running to the surface, and in them many round cells, but nothing to indicate malignancy. No local treatment had been pursued.—*British Med. Journ.*, April 5, 1884.

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The Castration of Women.

A recent number of the *Zeitschr. f. Geburts. u. Gynäk.* contains an article by Dr. WILHELM TAUFFER, of Buda-Pesth, on the above subject. He relates twelve cases of this operation performed by himself, and then presents the conclusions which follow. We cannot say that this author is as cautious in drawing inferences as we should like, but we give his propositions, which must be taken for what they are worth. (1) Castration is an operation which with proper care is not attended with any great risk: the unavoidable mortality being now less than 10 per cent. (2) The operation should be performed with antiseptic precautions and under carbolic spray; the abdominal cavity should be closed; drainage is only exceptionally required. (3) The limitation, that castration is not called for when the climacteric is near, can only be conditionally accepted, because the age at which the climacteric occurs is very different in different individuals, and cannot be foretold. (4) The condition laid down by Hegar, that the ovaries should be distinctly felt before their extirpation is attempted, is an

impracticable one. (5) Both ovaries should be removed, even if the disease be limited to one; excepting in cases where special circumstances make it desirable to leave behind the apparently healthy ovary. The reason for removing both ovaries is, that the remaining gland has a tendency to become diseased in the same way as its fellow. (6) It is generally desirable to remove the tubes as well as the ovaries; and it is unconditionally necessary if there be the slightest appearance of the disease in them. (7) Hystero-epilepsy is curable by castration. (8) The symptoms grouped together under the name of hysteria, when rightly analysed, can often be traced back to ovarian disease. (9) The question as to the influence upon uterine fibroids of the ligature of large nutrient vessels going to them, without castration, is worth consideration. (10) With regard to prognosis it is important to remember that the menopause only follows immediately upon the operation in those cases in which the neighbouring organs are not diseased; but all inflammatory conditions of them delay the climacteric. (11) The final result of castration can only be determined after the lapse of months. (12) It must be regarded as an open question how far diseases of the female sexual organs influence the development of certain psychoses. (13) So must the question whether such psychoses are curable by castration. (14) In the interest of unity and comparison of observations, it is desirable that the classification of cases (suitable for this operation) adopted by Hegar should be generally accepted.—*Med. Times and Gaz.*, April 12, 1884.

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Dystocia from Tumour of the Cervix Uteri; Porro Operation.

M. DENARIES reports (*Journ. d'Accouch.*, 1883, Sept. 15) the case of a woman, æt. 42 years, xivpara, whose last confinement had taken place two years before. This labour had been very hard.

In the present case a twin pregnancy was diagnosticated, it seeming that both heads were presenting at once. Attempts at reposition were of no avail, and palpation of the uterus was difficult on account of the great hardness and sensitiveness. Attached to the iliac bone of the fœtus was a tumour which could be felt per vaginam. It filled the pelvic outlet almost completely, so that only a canal about four-fifths of an inch was open. The child was dead. The true Porro operation was performed, the pedicle treated by the extra-peritoneal method, and the patient was well in two months.—*Centralbl. für Gynak.*, April 19, 1884.

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Catamenial Phenomena in Porro Patients.

M. ABEL DAMOUR has recently made an analysis of 31 successful cases of this operation. In 23 cases the menopause followed the operation. In 8 cases there were certain phenomena at each period, flushes of heat, sensation of fulness in the head, cramps, cephalalgia, tendency to syncope, troubles of vision, etc. In some cases there were true supplementary hemorrhages. One of Championnière's patients had a rectal hemorrhage two months after the operation, which returned five times. She then had an attack of hematuria. One of Porro's patients had a discharge from the abdominal wound for four days at the menstrual epoch. A patient of Ramello had epistaxis every month, and Tarnier, Breisky, and Braun have noted bloody discharges from the vaginal walls.—*Archives de Tocologie*, April, 1884.

A MEMOIR OF

SAMUEL D. GROSS, M.D., LL.D., D.C.L.,

EMERITUS PROFESSOR OF SURGERY IN THE JEFFERSON MEDICAL COLLEGE OF PHILADELPHIA.

In the history of American medicine, in the long list of names of men who have been especially distinguished by their valuable contributions to the science and art of surgery, we find but two who are conspicuously pre-eminent, and upon whom, each alone in his generation, has been conferred by general assent the honoured title of "The Nestor of American Surgery." Of the two, Philip Syng Physick was gathered unto his fathers nearly half a century ago; and to-day we mourn the loss of SAMUEL D. GROSS.

Dr. Physick, although a surgeon of great learning and brilliant capacity, added but little to the literature of our profession, and he left his impress upon American surgery chiefly through the fading tradition of his teachings. But Dr. Gross was, in addition, an industrious and voluminous writer, and has left a precise and imperishable record of his profound study and vast surgical experience.

Dr. Gross was born near Easton, Pennsylvania, July 8, 1805. He received a classical education at the Wilkesbarré Academy and at the Lawrenceville High School, both famous institutions in their day, the former having been under the charge of Mr., afterwards Judge, Joel Jones, a graduate of Yale College, and the latter having been presided over by the Rev. Dr. Isaac Brown, an alumnus of Princeton College. At the age of nineteen he began the study of medicine, first under Dr. Joseph K. Swift, of Easton, and subsequently with Professor George McClellan, the eminent surgeon of Philadelphia. He graduated from the Jefferson Medical College in 1828, and immediately began practising his profession in Philadelphia. During the first ten months of his novitiate, to fill up the intervals of practice, which came but slowly, he translated from the French and German Bayle and Hollard's General Anatomy, Hildebrand on Typhus Fever, Hatin's Manual of Obstetrics, and Tavernier's Operative Surgery, for which he received eight hundred and seventy-five dollars. In 1830, or two years after his graduation, he published his "Treatise on the Anatomy, Physiology, and Diseases of the Bones and Joints," in which he called attention to the employment of adhesive plaster as a means of extension in fractures of the lower extremity, a method of treatment almost universally in vogue at the present day.

After the lapse of eighteen months, having in the meanwhile married, and his patrimony being almost exhausted, Dr. Gross returned to Easton, where he soon acquired a good practice; and when he left for Cincinnati, in October, 1833, two years and a half afterward, he was regarded as the most learned practitioner of the place. To increase his knowledge of practical anatomy he erected at the foot of his garden a dissecting-room, having brought his first cadaver in a buggy from Philadelphia, but he subsequently obtained material nearer home, not, however, without incurring great risk of detection. He dissected and performed the more important operations on the cadaver several hours daily, and in this way obtained a vast amount of information which proved of the utmost value to him in subsequent years. All his leisure hours in the summer were spent upon the composition of a work on descriptive anatomy, which was, however, never completed. The MS., still in existence, contains the first effort in the English language to change the nomenclature of anatomy from Latin into English, a plan which, at his suggestion, was afterward adopted by his pupil, Dr. T. G. Richardson, now Professor of Surgery in the University of Louisiana, in his work on Anatomy, and subsequently by Professor Leidy, of the University of Pennsylvania, in his text-book on Anatomy.

During his residence at Easton, Dr. Gross made a series of observations upon the temperature of venous blood—altogether fifty in number—mostly of healthy persons, and found, as an average, 96° Fahr., the maximum being 104°, and the minimum 92°. Hence, he regarded the average of 98°, as usually stated, as too high. The results of these investigations were published at Cincinnati in 1835, in the second volume of the *Western Medical Gazette*. He also noticed in these observations a singular phenomenon, then, if not still, unknown, that if the arm be tied firmly for five or six minutes before opening the vein, the temperature of the blood which flows during the first thirty or forty seconds will be several degrees lower than that which issues subsequently, a fact which is probably due to the stationary condition of the blood in the veins. In addition to these experiments, he conducted others upon excretion to ascertain the rapid transit of certain articles, when taken into the stomach, through the blood by the kidneys. For this purpose he selected rabbits, to which, after having tied both renal arteries, he administered protoxide of iron. The animals were killed within fifteen to thirty minutes, and upon applying a solution of cyanide of potassium to the urine in the bladder, ureters, and kidneys, well-marked traces of iron were invariably found in that fluid. To those who remember the doctrine of solidism, so dominant in the schools of those days, these investigations are not without their significance. Another experiment which interested him at this time very much was the inoculation of a cat with the virus of smallpox, the object being to ascertain whether Gendrin was right in asserting that the disease could be communicated in this way to an inferior animal. With the exception of slight suppuration, no ill effects followed.

In 1833 he performed a series of experiments upon rabbits with a view of throwing light upon manual strangulation, a full account of which was published in the ninth volume of the *Western Medical and Physical Journal*, and an abstract of which will be found in the second volume of Beck's "Medical Jurisprudence," with appropriate comments by that distinguished author. Shortly before these experiments were made, Dr. Gross was the chief medical witness in the case of Goetter, which constituted the most important event during his professional life at Easton. Goetter had killed, by manual strangulation in the eighth month of her pregnancy, a woman whom he had seduced. Dr. Gross made the post-mortem examination, but neglected to open the skull, and on this account was subjected to considerable annoyance during the trial, as the defence partly rested upon the ground that the woman had died of apoplexy. It was evident, however, from the marks upon her neck, and the condition of the face and lungs, that she had died from asphyxia, and he gave his testimony accordingly. The man was convicted solely upon circumstantial evidence, but the day before his execution he confessed that he had choked the woman to death with his hand.

In October, 1833, Dr. Gross, after having been offered the chair of Chemistry in Lafayette College, Easton, removed to Cincinnati to accept the demonstratorship of anatomy in the Medical College of Ohio, and here he commenced his career with a hundred and fifty dollars in his purse. His first class numbered nearly sixty out of a total class of about eighty-six, with a ticket of ten dollars. He gave regularly three lectures a week, chiefly on surgical and visceral anatomy, kept the rooms well supplied with subjects, and thus laid the foundation of the study of practical anatomy, which up to that time had been merely nominal in the Western States. In the spring and autumn he delivered private courses to small classes, earning little money, but accumulating valuable knowledge, and acquiring reputation as a zealous anatomist and a successful teacher.

Dr. Gross remained in the Medical College of Ohio only two sessions; when, in 1835, he was unanimously appointed to the chair of Pathological Anatomy in the Medical Department of the Cincinnati College. During the first few years after his appointment he abandoned himself almost wholly to a special course of study to aid him in the discharge of his official duties. His medical friends did all they could to obtain for him post-mortem examinations, of which full notes were always taken, and the specimens preserved. In this way he laid the foundation of a museum of morbid anatomy, which, when the college was broken up, four years after its organization, contained a large number of valuable preparations.

It was from these dissections, from an elaborate course of reading, and from numerous visits to the slaughter-houses of Cincinnati, that Dr. Gross derived the knowledge upon which was founded his "Elements of Pathological Anatomy," issued in 1839, in two octavo volumes of upwards

of five hundred pages each. The book was illustrated by numerous wood-cuts and several coloured engravings, and was the first systematic work upon the subject ever published in the United States, or, indeed, in the English language. A second edition, greatly enlarged and thoroughly revised, was issued in 1845, in one large octavo volume of eight hundred and twenty-two pages, profusely illustrated, and full of marginal references, which greatly enhanced its value as a learned work. The third and last edition appeared in 1857, and in its preparation, especially the microscopical portion, the author was assisted by Dr. Da Costa. The work, in its original form, cost Dr. Gross, who had no one to advise or guide him, much labour and anxiety, having been written in the intervals of a large and increasing practice, during hours often snatched from sleep, and under the exhaustion of fatigue, upwards of three years having been spent upon its composition. That he had not laboured in vain was indicated not only by the reputation, both at home and abroad, which his researches in this branch brought him, but by an incident which was peculiarly gratifying to him. In July, 1868, Virchow had invited a number of prominent men to meet Dr. Gross at his residence in Berlin, among whom were Von Langenbeck, Von Graefe, Donders, and Gurlt. Toward the conclusion of the dinner, the host, availing himself of a lull in the conversation, drew forth a large volume from under the table, and, rising, took Dr. Gross by the hand, and made him an eloquent address, complimenting him upon his labours as a pathological anatomist, and referring to the work, which happened to be the second edition of his "Elements of Pathological Anatomy," as one from which he had derived much useful instruction, and one which he always consulted with much pleasure. It need not be said that the author was deeply flattered by this great honour, so unexpectedly and so gracefully bestowed upon him by the great German pathologist. This estimate of the value of his book was more than compensation for all the toil and anxiety which it had cost him.

While engaged in the preparation of his "Pathological Anatomy" Dr. Gross contributed numerous papers to periodical literature, instructed a number of private pupils, attended to a large general and consultation practice, and never missed a lecture. In 1839, he was unanimously appointed Professor of Medicine in the University of Virginia, a compliment the more honourable because it was unsolicited on his part, and a short time previously he had been offered the Chair of Anatomy in the University of Louisiana. These offers were promptly declined; and it was well that they were, as a far more important position awaited him. During the spring of 1840 he accepted the Professorship of Surgery in the Louisville Medical Institute, afterwards the University of Louisville, which had been rendered vacant by the resignation of Dr. Joshua B. Flint. The most distinguished members of the faculty of this school at that time were Daniel Drake, Charles Caldwell, John Esten Cooke, and Jedediah Cobb.

Dr. Gross was the youngest member of the faculty, and, although he had never taught surgery, he was thoroughly acquainted with its principles and practice, and had no misgivings upon entering upon the discharge of the duties of the chair. As a teacher he had never known what failure was, and he felt certain that he would succeed in his new field of labour. The class, during the first winter of his connection with the school, numbered two hundred and four, from which it afterwards increased to four hundred and six, the largest it ever had. As there was no rent to be paid, the net proceeds of each chair amounted for quite a number of years annually to nearly $5000.

The government of the University of Louisville was invested in a board of trustees, who were self-appointing. In 1849, an attempt was made by the city of Louisville, through the Supreme Court of Kentucky, to wrest the government of the school from the hands of the men who had so ably managed its affairs, and to make the board elective by the people. At this particular crisis, being in doubt as to how the suit would terminate, Dr. Gross accepted the offer of the Chair of Surgery in the University of the City of New York, rendered vacant by the retirement of Valentine Mott, his colleagues being Granville Sharpe Pattison, John W. Draper, Gunning S. Bedford, Martin Payne, and Elisha Bartlett, all men of distinction and ability. Dr. Gross was then forty-five years of age, full of ambition, and determined to do full justice to his chair. He passed the winter of 1850–'51 in New York; but, long before the termination of the session, he was solicited by his late colleagues at Louisville to resume his chair in its University, the suit in the mean time having been decided in favour of the board of trustees. Dr. Gross found that the University of New York was then unpopular with the profession of that city, that the college edifice was ill-adapted to its objects, that living and rents were exorbitantly high, and, in short, that the prospects of the institution were not such as, in his opinion, to render it desirable to continue his connection with it. These considerations, along with the earnest wish of his family to return to their former home, led him to tender his resignation, and resume his chair in the University of Louisville, Dr. Paul F. Eve having withdrawn in his favour. The winter passed in New York was the most charming he had ever spent. With four didactic lectures and two clinics a week, and little private practice, he gave himself up to amusements, social intercourse, and visits to the hospitals. He also attended a course of lectures on the microscope by Mr. Goadby, an English gentleman, and spent much of his leisure upon the composition of his work on the urinary organs, commenced several years previously, and completed a short time before the close of this winter's lectures. Had he remained in New York, he would doubtless have obtained a very large practice; but as he had left a more lucrative school, and had the most

commanding surgical practice in the southwest, he deemed it most prudent to retrace his steps.

Soon after Dr. Gross first went to Louisville, he instituted a series of experiments upon dogs, with the view of determining, more accurately than hitherto had been done, the nature and treatment of wounds of the intestines. These investigations, which were commenced in the spring of 1841, and continued, with various intermissions, for upwards of two years, involved the sacrifice of seventy dogs, and the results were originally published in a series of papers in the *Western Journal of Medicine and Surgery*, and finally embodied in a separate monograph, forming an octavo volume of two hundred and twenty pages, illustrated by wood-cuts and coloured engravings, and entitled an "Experimental and Critical Inquiry into the Nature and Treatment of Wounds of the Intestines." The work was an exhaustive one, and comprised an account of his own researches as well as a sketch of the literature of the subject. It was most favourably noticed in a long review in the *British and Foreign Medico-Chirurgical Review*, and was quoted approvingly by Mr. Guthrie in his work on "Military Surgery."

Much labour was spent upon these experiments, and they involved not a little sacrifice of feeling on his part, as he was naturally fond of dogs, and anæsthetics had not yet been discovered. In this connection, in view of the attacks on the profession now being made in this city by the American Antivivisection Society, it will prove interesting to quote the language of Dr. Gross, penned ten years ago, on this subject. He says:—

"I have sacrificed for experimental purposes nearly one hundred dogs, and, if I were not thoroughly satisfied that the objects had been most laudable, I should consider myself as a most cruel, heartless man, deserving of the severest condemnation. The results of my experiments will, I am sure, eventually receive that attention to which their importance so justly entitles them. The experiments of Jones on hemorrhage, of Smith and Travers on wounds of the intestines, of Magendie and Charles Bell on the functions of the nerves, and of hundreds of physicians upon the action of medicines upon the human frame, have shed an immense flood of light upon the healing art, putting to flight the mawkish sentimentality of the societies for the prevention of cruelty to animals, which have made so much ado about this matter."

His work entitled "A Practical Treatise on the Diseases, Injuries, and Malformations of the Urinary Bladder, the Prostate Gland, and the Urethra" was published by Blanchard & Lea in 1851, the MS. having been deposited with them on his return from New York to Louisville. The only then existing monographs on these affections of any importance in the English language were those of Sir Benjamin Brodie and Mr. William Coulson, two comparatively meagre productions, which, although very valuable, especially the former, were unsatisfactory. Hence such a work had long been needed, and it was at once accepted as an authority

upon the subjects of which it treated. He had long been accumulating the materials, and not less than three years were finally spent in arranging them for publication. A second edition, greatly enlarged and improved, was issued in 1855, and formed a closely-printed octavo volume of 925 pages, illustrated by 184 wood-cuts. In an appendix of 29 pages is the first and only attempt as yet made to furnish a complete account of the prevalence of stone in the bladder, and of calculous disorders in the United States, Canada, Nova Scotia, Europe, and other countries. In 1876 a third edition of the work appeared under the editorship of Dr. S. W. Gross, who rewrote much of it, introduced considerable new matter, and produced a valuable treatise fully up to the existing state of the science.

Dr. Gross's "Practical Treatise on Foreign Bodies in the Air-Passages" was issued from the press of Blanchard & Lea, in 1854, in an octavo volume of 468 pages, illustrated by 59 engravings on wood. Its composition required upwards of two years, and as it was the first attempt, in any language, to systematize our knowledge upon the subject, it was, strictly speaking, a pioneer work. Dr. Morrell Mackenzie, the highest authority upon the subject in Europe, in speaking of it nearly thirty years after its publication in his own admirable treatise on "The Diseases of the Throat and Nose," makes the following remarks: "This invaluable essay gives full reports of two hundred cases, and is so complete that it is doubtful whether it will ever be improved upon; indeed, the excellent articles of Bourdillat and Kühn subsequently published, the former based on three thousand, the latter on three hundred and seventy-four cases, only confirm the conclusions previously arrived at by Gross." It might have been added that Kühn plagiarized much of his material.

During his residence at Louisville, Dr. Gross was a liberal contributor to the *Western Journal of Medicine and Surgery*, edited by Dr. Drake. Among his earliest papers was an account of a case of axillary aneurism, for which he tied the subclavian artery. It was accompanied by a statistical notice of all that had been done in regard to the surgery of this vessel up to that period. Another very elaborate paper was published in 1852 on the "Diseases and Operations on the Jaws," and one of his last contributions to its pages was a "Discourse upon the Life and Character of Daniel Drake," embracing nearly one hundred pages.

In 1851 he prepared a very full and exhaustive "Report on Kentucky Surgery" for the Kentucky State Medical Society, and afterwards published in its Transactions. It contained a biography of Ephraim McDowell, with a full vindication of his claims as the originator of ovariotomy in 1809. In 1853 he sent to the American Medical Association, at its meeting in Richmond, Virginia, an exhaustive report on the "Results of Surgical Operations in Malignant Diseases." It comprised one hundred and thirty-seven pages of its volume of Transactions, and embodied the experience of the principal surgeons of all ages and countries.

At the meeting of the Association at Detroit, in 1856, he read a "Report on the Causes which Retard the Progress of American Medical Literature," in which he took strong ground against the editing of foreign works by American writers, and animadverted in severe terms upon our medical journals for their indiscriminate praise of European reprints. During the same period he contributed several papers to the *American Journal of the Medical Sciences*. One of these was the report of a case, full of interest, of "Gunshot Wound of the Neck, involving the Spinal Cord and Subclavian Artery, and Causing Death by Convulsions." The paper, however, which attracted most attention was the report in the October number for 1852 of an operation which he performed in 1849 upon a child three years old, the subject of a congenital malformation, consisting in complete absence of the vagina and the presence of well-formed testes in the labia. The object was to prevent, effectually, if possible, the development with puberty of sexual desire, as the malformation would render intercourse quite impossible. Although the operation was severely criticized, Dr. Gross never felt cause to regret the course he had adopted.

In the winter of 1856, Dr. Gross and Dr. T. G. Richardson founded the *Louisville Medical Review*, a bi-monthly journal of medicine and surgery, of which only six numbers appeared, since, by a strange coincidence, soon after the publication of the first, both editors received and accepted appointments in Philadelphia, Dr. Gross to the chair of Surgery in the Jefferson Medical College, and Dr. Richardson to that of Anatomy in the Pennsylvania College. Soon after their removal to Philadelphia, they issued the *North American Medico-Chirurgical Review*, one of the peculiar features of which periodical was that each department of the sciences was intrusted to a separate contributor, whose duty it was to furnish an abstract of the current literature, so that it always fully reflected the latest discoveries and improvements. The work prospered until the outbreak of the war, when all the Southern subscribers dropped off, and the publishers, J. B. Lippincott & Co., were compelled to abandon it at the close of its fifth year of publication. To the pages of these journals Dr. Gross contributed a number of original articles and elaborate reviews, including among others a remarkable and curious case of "Congenital Hypertrophy of the Gums," the "Nature and Treatment of Tuberculosis of the Hip-joint," "August Gottlieb Richter: his Works and his Contemporaries—A Retrospective Sketch," into which he introduced an account of Desault, Benjamin Bell, and Antonio Scarpa, and, finally, "A Sketch of the Life and Services of Ambrose Paré." The journals were also made, during the greater part of their existence, the vehicles of the reports of his clinics at the University of Louisville, the Jefferson Medical College, and the Philadelphia Hospital.

In 1855, Dr. Gross was solicited by Dr. René La Roche, a member of the Board of Trustees of the University of Pennsylvania, to allow his

name to be placed before that body as a candidate for the chair of Surgery, vacated by the resignation of Dr. Gibson. He was assured that the entire medical faculty, with one exception, that of Dr. Wood, had pledged themselves to support him, and would use their best endeavours to secure his election. Various reasons, however, induced him to decline, and he wrote, at the request of Dr. D. Hayes Agnew, a warm testimonial in favour of Dr. Henry H. Smith, who was elected.

Dr. Gross remained at Louisville for sixteen years, from October, 1840, to September, 1856. He became closely identified with the people and the interests of that city, and he was regarded as the most prominent surgeon of the southwest. Hence it is not surprising that, when it was announced in May, 1856, that he had accepted the chair of Surgery in the Jefferson Medical College, universal regret was expressed by both the medical profession and the citizens of Louisville. He received numerous letters from medical men in various parts of the valley of the Mississippi, remonstrating with him against his removal, but he did not feel that he could decline the honourable position in his Alma Mater which had been unanimously tendered him by its Board of Trustees and the faculty. Moreover, a strong motive which impelled him to remove to Philadelphia was the desire to be relieved of a large and annoying family practice, so that he might write an elaborate system of surgery, for which his leisure in Louisville was not sufficient, but upon the composition of which he had been engaged for several years.

Dr. Gross reached Philadelphia on Saturday, September 26, 1856, and delivered his first clinical lecture on the following Wednesday. He brought with him about one-half of his library, which consisted of nearly 4000 volumes, having deposited the remainder in boxes in the University of Louisville for safe-keeping. As he was about to go before his class on the ensuing 24th of December, the following telegram was handed to him: "The University was totally consumed by fire early this morning, including all your books and minerals." This intelligence greatly shocked him, his loss being the more keenly felt, as it comprised the most complete collection of works on the genito-urinary organs ever brought together in this country. Many of the books and pamphlets were from the library of the late John C. Crosse, the eminent lithotomist of Norwich, England, and could never be replaced.

In order that his literary pursuits might not be too much interfered with, Dr. Gross, upon his arrival in Philadelphia, confined himself strictly to office and consultation business, to patients from abroad, and to surgical operations. He set to work vigorously upon the completion of his "System of Surgery," which he had determined to make the most elaborate, if not the most complete, treatise in the English language. The heads of his lectures served him as a valuable guide, and he generally wrote with great facility, as his knowledge of the subject, from long

study, practice, and contemplation, was extensive, and, in the main, very accurate. He spent from five to eight hours a day upon his manuscript, and, unless greatly interrupted, he seldom wrote less than from ten to fifteen pages of foolscap in the twenty-four hours, and rarely rewrote anything, although he not unfrequently interlined. In this way he worked steadily until July 8, 1859, when he finally wrote the preface. Soon after, the work was issued in two portly octavo volumes, numbering, in the aggregate, 2360 pages, and profusely illustrated by engravings on wood. The sixth edition was published in October, 1882, and it was so thoroughly changed and so greatly improved over the preceding editions, as to constitute essentially a new production. The review of this work which gratified him most was given of the fifth edition in the *Dublin Journal of Medical Science* for 1874. It covered nearly fifty pages of that periodical, and was at once able, analytical, and critical. The review thus concludes: "His work is cosmopolitan, the surgery of the world being fully represented in it. The work, in fact, is so historically unprejudiced, and so eminently practical, that it is almost a false compliment to say that we believe it to be destined to occupy a foremost place as a work of reference while a system of surgery, like the present system of surgery, is the practice of surgeons." A Dutch translation, by Dr. Sachse, appeared at Nieuwediep in 1863.

At the outbreak of the war, Dr. Gross wrote a brief "Manual of Military Surgery," a pocket companion for the young surgeons who were flocking into the army. It was composed in nine days, and published in a fortnight from the time of its inception. Under the care of Lippincott & Co., it passed through two editions of 2000 copies each, was republished at Richmond, and was extensively used by the Confederate surgeons, and in 1874 was translated into Japanese and published at Tokio.

In 1861, Dr. Gross edited an octavo volume of upwards of 800 pages entitled "Lives of Eminent American Physicians and Surgeons of the Nineteenth Century," his own contributions being sketches of Ephraim McDowell, the ovariotomist; Drake, the great Western physician; and John Syng Dorsey, the nephew of Physick, and the author of the "Elements of Surgery."

In 1868, in the address which he read before the American Medical Association at its meeting at Washington, as its President, he called attention, among other matters, to a new method of appointing medical witnesses as experts in cases involving medico-legal considerations. In 1869, at the meeting at New Orleans, an elaborate paper from his pen on the "Training of Nurses" was read, which attracted much attention. At its meeting at Detroit, in 1874, he read an address on "Syphilis in its Relation to the National Health," which received the highest commendation, Dr. Sims offering a resolution for the appointment of a committee to present the subject to the consideration of the legislatures of the different

States and Territories. The following year he read before the same body, at its meeting at Louisville, "A Discourse on Bloodletting considered as a Therapeutic Agent;" and at its meeting in Chicago, in 1877, he read a paper on the "Proximate Cause of Pain." In October, 1875, he delivered two elaborate lectures introductory to his course at the College on the "History of American Medical Literature from 1776 to the Present Time," which were afterwards issued in a brochure of 85 octavo pages.

In the *American Journal of the Medical Sciences* for April, 1876, is an article, occupying 53 closely printed pages, from his pen on the "History of American Surgery from 1776 to 1876," which is one of several papers prepared by different writers illustrative of the progress of the different branches of medicine in this country during the century, and which, together with those papers, was issued in book form under the title of a "Century of American Medicine."

During his residence in Philadelphia, in addition to the works and papers already mentioned, Dr. Gross made many literary contributions to various journals and societies, among which may be mentioned "Practical Observations on the Nature and Treatment of Prostatorrhœa," 1860; "Brunonianism, Toddism, and other Isms," 1860; "Necrological Notice of Jedediah Cobb, M.D., formerly Professor of Anatomy in the University of Louisville," 1861; "Biographical Sketch of Charles Wilkins Short, M.D., formerly Professor of Materia Medica and Medical Botany in the University of Louisville," 1865; "Then and Now," 1867; "The Live Physician," 1868; "A Memoir of Valentine Mott, M.D.," 1868; "A Memoir of Robley Dunglison, M.D.," 1869; "Nature's Voice in Disease and Convalescence," 1870; "A Discourse on Ambrose Paré," 1873; "An Oration in Honour of Ephraim McDowell," delivered before the Kentucky State Medical Society at its meeting at Danville, at the dedication of the monument erected to his memory, 1879; "A Memoir of Dr. Isaac Hays," late editor of the *American Journal of the Medical Sciences*, 1879; "John Hunter and his Pupils," 1881; "Value of Early Operations in Morbid Growths," 1883; and "The Best Means of Training Nurses for the Rural Districts," 1883. His last contributions, composed a few weeks before his death, were one on "Wounds of the Intestines," read before the American Surgical Association by Professor Richardson, April 30, 1884; and one on "Lacerations of the Female Sexual Organs, consequent upon Parturition, their Causes and their Prevention," read before the American Medical Association on May 8, 1884, two days after he expired.

Dr. Gross became a writer early in his professional life. He had hardly received his degree before he began to translate French and German medical works. During the first summer, he assisted Dr. John D. Godman, the anatomist and naturalist, in translating the Duke of Saxe-Weimar's "Travels in the United States," and the next year he wrote his work on the "Bones and Joints." He was always a hard student

and incessant thinker. He accomplished the vast amount of writing which he did simply by working in an orderly and systematic manner, with a distinct, definite aim, and never allowing anything to interfere with the consummation of his labours. As he frequently said, his genius was the genius of industry, perseverance, and common sense. He thought out many of the details of his writings while making his daily rounds, and it was his constant habit, on returning to his office, to commit to paper what he had outlined in his busy brain.

After his graduation, the great ambition of Dr. Gross was to become a teacher. His first effort in this direction was as Demonstrator of Anatomy in the Medical College of Ohio, in which, as previously stated, he delivered three lectures a week for two years. In the Cincinnati College he lectured for four years on pathological anatomy, after which he taught surgery for forty-two years. During all this time he invariably spoke extemporaneously with the aid of a few brief headings; but he never appeared before his class without previous study and meditation, and a thorough comprehension of his subject. Order and system were among his more important attributes as a teacher. Those who have heard him will never forget his enthusiasm; the clearness, force, and directness of his language; the marked interest he felt in what he was saying and doing; and the evidence of the feeling that he had a solemn duty to perform, and that upon what he uttered might depend the happiness or misery of thousands of human beings. The opening portion of his course on surgery was devoted to the discussion of the principles, the topics discussed having been inflammation and its consequences, syphilis, struma, tumours, and wounds. These topics being disposed of, he took up the diseases and injuries of particular regions, organs, and tissues, confining himself as much as possible to matters of fact, and not indulging in hypotheses, conjecture, or speculation. His knowledge of pathological anatomy was of immense benefit to him in these exercises, and he freely availed himself of it as a means of illustrating every subject that he had occasion to discuss. Indeed, he always asserted, that whatever reputation he possessed as a teacher and a writer, was in great degree due to his familiarity with morbid anatomy. What added greatly to his charm as a lecturer were his admirable diction, his commanding presence, and a resonant and well-modulated voice.

In March, 1882, being in the full possession of his intellectual and physical powers, but being actuated by a desire to spend the remainder of his days in comparative repose, he resigned the chair of Surgery in the Jefferson Medical College, which he had filled for twenty-six years, and he was thereupon unanimously elected emeritus professor.

Dr. Gross had a great fondness for surgery. After his removal to Louisville, his name became widely known as a practical surgeon, and there was no one in the Valley of the Mississippi who did so large a practice as he, especially after the retirement of Dr. Dudley, who had

so long wielded the surgical sceptre at Lexington. He possessed all the qualities of a good operator, a thorough knowledge of regional anatomy, quick perception, rapidity in judgment, perfect self-control, a steady hand, and an unflinching eye. He rarely failed to accomplish what he had set out to do, and he never lost a patient upon the table from shock, hemorrhage, or anæsthesia. He performed many major operations, and had an extended reputation as a lithotomist, having cut 165 patients, with 14 deaths. Of 72 children, all except 2 survived, while of 93 operations in adults and old persons, 12 died.

During the War of the Rebellion, he took great interest in gunshot wounds, visiting many battle-fields and hospitals to observe their peculiar features, of which he made valuable notes. In the spring of 1862, Surgeon-General Hammond offered him the post of Surgeon-in-Charge of the George St. Hospital in this city, but as he had no fitness for the position he promptly declined it, preferring to be placed in charge of the surgical ward, so as to be the better able to study gunshot injuries.

In addition to the various experiments already alluded to, he made not a few original contributions to surgery. He was the first to suggest or perform for ganglia of the hand and foot subcutaneous section followed by firm compression; high amputation in senile gangrene; the suturing of divided nerves and tendons; deep stitches in wounds of the wall of the abdomen, to prevent hernia or protrusion of the bowel after recovery; wiring the ends of the bones in dislocations of the sterno-clavicular and acromio-clavicular articulations; a modification of Pirogoff's amputation at the ankle-joint, unjustly ascribed to Dr. Quimby; a mode of operating for inverted toe nails; an operation for neuralgia of the jaws in old persons; laparotomy in rupture of the bladder; and a direct operation for hernia by suturing the pillars of the ring. He was also the first to describe prostatorrhœa, pododynia, and the use of adhesive plaster as a means of making extension in the treatment of fractures of the lower extremity. He was the inventor of an enterotome, urethrotome, tracheotomy forceps, blood catheter, arterial compressor, tourniquet, an instrument for extracting foreign bodies from the ear and nose, and an apparatus for the transfusion of blood. In his "Pathological Anatomy" he has given a description of a number of dissections of specimens of false conceptions, or uterine moles, as they are termed, the first account in the English language. He was also the first to suggest the use of ergot in the treatment of diabetes. The case was that of a woman brought to him by Dr. Shearer, of Berks County, Pa., who published an account of it in the *Medical and Surgical Reporter*.

Dr. Gross's majestic form and dignified presence, his broad brow and intelligent eye, his deep, mellow voice, and benignant smile, his genial manner and cordial greeting, remain indelibly impressed upon the memory of all who knew him. He was a man of deep mind and broad views, and he

was a model of industry and untiring zeal. He always had some literary work in hand, and he was in the habit of rising early in the morning, generally at six o'clock, and accomplishing considerable writing before breakfast. His style was vigorous and pure, and the amount of work he accomplished was simply immense. It is safe to say that no previous medical teacher or author on this continent exercised such a widespread and commanding influence as did Prof. Gross. His writings have been most learned and voluminous, and his classes among the largest that have ever been collected in this country. As a citizen he was public-spirited and influential, and he always most jealously guarded the *esprit de corps* of his own profession. In every project to advance its interests or to protect or honour any of its deserving members he was foremost. On account of the universally recognized eminence of his authority as a surgeon he was frequently called into court as an expert to testify in malpractice suits, and he was ever ready cheerfully to give his time, knowledge, and influence in maintaining the right, and he never thought any trouble too great to aid an unfortunate professional brother. He took a deep interest, too, in the struggles and success of young men, born perhaps of his own experience, and he was always ready to assist them by his counsel and advice. His house was the seat of a wide and generous hospitality, and distinguished strangers, professional and non-professional, were welcome guests at his table. While fond of social life, he never appeared so happy as when surrounded by his own family. He was, too, an ardent lover of the beauties of nature, with a special fondness for flowers, of which a few were always to be found close by his side on his study table.

Dr. Gross attained unusual eminence in the world of medicine. He was a member or fellow of numerous medical societies and other organizations, both American and foreign, including among the former the College of Physicians of Philadelphia, the Philadelphia County Medical Society, the Pathological Society of Philadelphia, the Philadelphia Academy of Surgery, the Academy of Natural Sciences, the American Philosophical Society, the Pennsylvania State Medical Society, the Medical Jurisprudence Society of Philadelphia, the Massachusetts Medical Society, the New York State Medical Society, the Academy of Medicine of New York, the Cincinnati Medical Society, the Ohio Historical and Philosophical Society, the Medical Society of Louisiana, the Kentucky State Medical Society, the American Medical Association, the American Surgical Association, the National Association for the Protection of the Insane, and the American Public Health Association. He was the founder of the Pathological Society of Philadelphia, of the Academy of Surgery of Philadelphia, and of the American Surgical Association, and one of the founders of the Kentucky State Medical Society, and of the Medical Jurisprudence Society of Philadelphia, of

which organizations, as well as of the International Medical Congress, held at Philadelphia in 1876, the Philadelphia County Medical Society, the Pennsylvania State Medical Society, the Kentucky State Medical Society, the American Medical Association, the Medical College Association, and the Pennsylvania College of Dental Surgery he served as president. Of foreign societies, he was an honorary member of the British Medical Association, the Royal Medical and Chirurgical Society of London, the Clinical Society of London, the Pathological Society of London, the Medico-Chirurgical Society of Edinburgh, the Imperial Medical Society of Vienna, the Medical Society of Christiania, the Royal Society of Public Medicine of Belgium, and the Medical Society of San Luis Potosi.

On April 3d, 1881, Dr. Gross received a letter from Mr., now Sir, William MacCormac, Honorary Secretary-General, inviting him to deliver the address in behalf of the American delegates to the International Medical Congress, which met in London in August of that year. To his great regret, he was unable to be present, and therefore was forced to decline the honour.

Dr. Gross was made an LL.D. by the Jefferson College, of Canonsburgh, in 1861. In 1872, the University of Oxford conferred upon him the degree of D.C.L.; the University of Cambridge her degree of LL.D. in 1880; and the University of Edinburgh and the University of Pennsylvania conferred the same degree, *in absentia*, in April and May, 1884.

Save an occasional twinge from rheumatic gout during his later years, Dr. Gross enjoyed excellent health to within a few months of his last illness. During the autumn and early winter of 1883, he was troubled with several attacks of indigestion, swollen feet, and other signs of weak heart, which, however, readily yielded to remedies. Early in January he had a mild attack of bronchial catarrh, which confined him to the house. Being thus deprived of out-door exercise, signs of dyspepsia again set in, and with the view of gaining strength to attend the meetings of the American Surgical Association, and of the American Medical Association in May, upon which he had set his heart, he went to Atlantic City on the 31st of March. On the following Sunday he was seized with intense nausea, and reached home the next afternoon much exhausted. From this time until his decease, May 6th, at twenty minutes to one o'clock, it was with great difficulty that he could be induced to take nourishment, and death ensued from sheer exhaustion, despite the unremitting attention of Professor Da Costa, and of his son, Professor S. W. Gross, aided by the wise counsel of his able and distinguished friend, Professor Austin Flint.

The post-mortem examination disclosed marked gastric catarrh, with irregular thickening of the mucous membrane, fatty heart, and a large cyst of the right kidney. The brain weighed forty-eight ounces.

The funeral services were held in the presence of his family and at

tendants, on the afternoon of May 7. His remains were then taken to the crematory at Washington, Pa., where they were reduced to ashes. On the following Sunday they were deposited in the family vault beside the coffin of his wife, at Woodlands Cemetery. These last rites were strictly in accordance with his expressed wishes; and his friends had known for many years his desire to be cremated, which he regarded as the only decent and correct manner of disposing of the dead.

The record of such a well-spent life is a valuable lesson which we do well to study and reflect upon. It serves as both precept and example, and invites us to emulate that energy, assiduity, and perseverance through which, aided by considerable native ability, the subject of this memoir acquired widespread distinction as a surgeon, a writer, a teacher, and a man. It shows that talent with industry cannot be repressed by adverse surroundings, but that it grows stronger in overcoming obstacles. Had Dr. Gross after graduation supinely waited for his ability to be discovered and for preferment to seek him, sheer want would probably have driven him to other pursuits, and his name would have been unknown to surgery. But, as we have seen, from the very moment of his graduation he entered upon the restless contest for distinction, and he created his own opportunities. When as yet he had had no time to gain experience in the practice of his profession, he did useful work, and made his name known by translating the books of several Continental authors of distinction. Shortly afterward, under all the disadvantages of restricted means and adverse surroundings, he undertook original investigations in anatomy, physiology, pathology, and surgery, which gradually gave him a substantial and constantly-growing reputation, until finally he reaped, through the force of his own labours, all the honours which his own profession could bestow, and enjoyed a celebrity extending over both continents.

In the death of Dr. Gross we have lost one of the brightest examples of the skill and learning, the conscientiousness and assiduity, the patience and perseverance, the dignity and morality by which our profession is truly ennobled. He has left us as a heritage a world-wide reputation which, as we regard it with conscious pride, cannot but stimulate us to a higher sense of our duty to our profession and to our fellows.

I. M. H.

Boylston Medical Prize Questions.

Questions proposed for 1885.

I. Alleged recent reappearance of Intermittent Fever in New England. Its History and the Pathology of the Disease. Prize $250.

II. The best preliminary Education for the Study of Medicine. Prize $200.

Questions proposed for 1886.

I. Influence of the Soil as a Factor in the causation and spread of Typhoid Fever. Prize $350.

II. The Relation of Hospitals to Medical Education. Prize $200.

Essays to be sent before the first Wednesday in April of each year.

For further particulars address

WM. F. WHITNEY, M.D.,
Sec'y Boylston Prize Committee.

HARVARD MEDICAL SCHOOL, Boston, Mass.

WELLS ON THE EYE.—New Edition.

A Treatise on Diseases of the Eye. By J. SOELBERG WELLS, F.R.C.S., Professor of Ophthalmology in King's College Hospital, London, etc. Fourth American, from the third London edition. Thoroughly revised, with copious additions, by CHARLES S. BULL, M.D., Surgeon and Pathologist to the New York Eye and Ear Infirmary. In one large and very handsome octavo volume of 822 pages, with 257 illustrations on wood, six colored plates, and selections from the test-types of Jaeger and Snellen. Cloth, $5.00; leather, $6.00; very handsome half Russia, raised bands, $6.50.

This magnificent work is *par excellence* the standard work of the times on the important subjects of which it treats. It is absolutely necessary for the physician to have an acquaintance with the pathology and therapeutics of the eye. From no source can he more accurately derive this needed knowledge than from the volume before us.—*Medical and Surgical Reporter*, August 4, 1883.

POLITZER ON THE EAR.

A Text-Book of the Ear and its Diseases. By Dr. ADAM POLITZER, Imperial-Royal Professor of Aural Therapeutics in the University of Vienna. Translated at the Author's request, by JAMES PATTERSON CASSELLS, M.D., M.R.C.S. In one handsome octavo volume of 800 pages, with 257 original illustrations. Cloth, $5.50.

The work itself we do not hesitate to pronounce the best upon the subjects of aural diseases which has ever appeared, systematic without being too diffuse on obsolete subjects, and eminently practical in every sense. The whole work can be recommended as a reliable guide to the student, and an efficient aid to the practitioner in his treatment.—*Boston Medical and Surgical Journal*, June 7, 1883.

HAMILTON ON NERVOUS DISEASES.—Second Edition.

Nervous Diseases; Their Description and Treatment. By ALLAN MCLANE HAMILTON, M.D., Attending Physician at the Hospital for Epileptics and Paralytics, Blackwell's Island, New York, and at the Out Patients' Department of the New York Hospital. Second edition, thoroughly revised and rewritten. In one octavo volume of 598 pages, with 72 illustrations. Cloth, $4.

When the first edition of this good book appeared, we gave it our emphatic endorsement, and the present edition enhances our appreciation of the book and its author as a safe guide to students of clinical neurology. One of the best and most critical of English neurological journals, *Brain*, has characterized this book as the best of its kind in any language, which is a handsome endorsement from an exalted source. The improvements in the new edition, and the additions to it, will justify its purchase even by those who possess the old.—*Alienist and Neurologist*, April, 1882.

HENRY C. LEA'S SON & CO., Philadelphia.

University of the City of New York.

MEDICAL DEPARTMENT.

410 East Twenty-sixth St., opp. Bellevue Hospital, New York City.

FORTY-FOURTH SESSION, 1884-85.

FACULTY OF MEDICINE.

REV. JOHN HALL, D.D., LL.D., *Chancellor of the University, ad interim.*

ALFRED C. POST, M.D., LL.D., Professor Emeritus of Clinical Surgery; President of the Faculty.

CHARLES INSLEE PARDEE, M.D., Dean of the Faculty; Professor of Otology; Surgeon to the Manhattan Eye and Ear Hospital.

J. W. S. ARNOLD, M.D., Professor Emeritus of Physiology and Histology.

JOHN C. DRAPER, M.D., LL.D., Professor of Chemistry.

ALFRED L. LOOMIS, M.D., LL.D., Professor of Pathology and Practice of Medicine; Physician to Bellevue Hospital.

WM. DARLING, M.D., LL.D., F.R.C.S., Professor of General and Descriptive Anatomy.

WILLIAM H. THOMSON, M.D., Professor of Materia Medica, and Therapeutics; Diseases of the Nervous System; Physician to Bellevue Hospital.

J. WILLISTON WRIGHT, M.D., Professor of Surgery; Surgeon to Bellevue Hospital.

WM. MECKLENBERG POLK, M.D., Professor of Obstetrics and Diseases of Women and Children; Physician to Bellevue Hospital, and to Emergency Lying-in Hospital.

LEWIS A. STIMSON, M.D., Professor of Physiology and Histology; Professor of Clinical Surgery; Surgeon to Bellevue Hospital; Curator to Bellevue Hospital.

STEPHEN SMITH, M.D., Professor of Clinical Surgery; Surgeon to Bellevue Hospital.

A. E. MACDONALD, LL.B., M.D., Professor of Medical Jurisprudence and Diseases of the Mind; Medical Superintendent of the New York City Asylum for the Insane.

HERMAN KNAPP, M.D., Professor of Ophthalmology; Surgeon to the Ophthalmic Institute.

S. OAKLEY VANDERPOEL, M.D., LL.D., Professor of Public Hygiene.

FANEUIL D. WEISSE, M.D., Professor of Practical and Surgical Anatomy; Surgeon to Workhouse Hospital, B. I.

R. A. WITTHAUS, M.D., Professor of Physiological Chemistry.

HENRY G. PIFFARD, M.D., Clinical Professor of Dermatology; Surgeon to Charity Hospital.

F. R. S. DRAKE, M.D., Clinical Professor of Medicine; Physician to Bellevue Hospital; Physician to Emergency Hospital.

JOSEPH E. WINTERS, M.D., Clinical Professor on Diseases of Children.

N. M. SHAFFER, M.D., Clinical Professor of Orthopædic Surgery; Surgeon to New York Orthopædic Hospital.

P. A. MORROW, M.D., Clinical Professor of Venereal Diseases; Surgeon to Charity Hospital.

THE PRELIMINARY SESSION will begin on Wednesday, September 17, 1884, and end October 1, 1884. It will be conducted on the same plan as the Regular Winter Session.

THE REGULAR WINTER SESSION will begin October 1, 1884, and end about the middle of March, 1885. The plan of Instruction consists of Didactic and Clinical Lectures, Recitations, and Laboratory work in all subjects in which it is practicable. To put the Laboratories on a proper footing a new building has been erected at an expense of forty thousand dollars. It contains Laboratories fitted for instruction in Chemistry, Histology, Pathology, Materia Medica, Operative Surgery, and Gynæcology.

Two to five Didactic Lectures and two or more Clinical Lectures will be given each day by members of the Faculty. In addition to the ordinary clinics, *special clinical instruction*, WITHOUT ADDITIONAL EXPENSE, will be given to the candidates for graduation during the latter part of the Regular Session. For this purpose the candidates will be divided into sections of twenty-five members each. All who desire to avail themselves of this valuable privilege must give in their names to the Dean during the first week in November. At these special Clinics students will have excellent opportunities to make and verify diagnoses, and watch the effects of treatment. They will be held in the Wards of the Hospitals and at the Public and College Dispensaries.

Each of the seven Professors of the regular Faculty will conduct a Recitation on his subject one evening each week. Students are thus enabled to make up for lost lectures, and prepare themselves properly for their final examinations without additional expense.

THE SPRING SESSION will begin about the middle of March and end the last week in May. The daily Clinics and Special practical Courses will be the same as in the Winter Session, and there will be Lectures on Special Subjects by Members of the Faculty.

It is supplementary to the Regular Winter Session. Nine months of continued instruction are thus secured to all students of the University who desire a thorough course.

FEES.

For course of Lectures	$140 00
Matriculation	5 00
Demonstrator's Fee, including material for dissection	10 00
Final Examination Fee	30 00

For further particulars and circulars address the Dean,

PROF. CHAS. INSLEE PARDEE, M.D.,

University Medical College 410 *East* 26*th St., New York City.*

The Jefferson Medical College
OF PHILADELPHIA.

THE Sixtieth Session of the Jefferson Medical College will begin on Wednesday, October 1st, 1884, and will continue until the end of March, 1885. Preliminary Lectures will be held from Monday, 15th of September.

PROFESSORS.

ELLERSLIE WALLACE, M.D. (Emeritus).
Obstetrics and Diseases of Women and Children.

J. M. DA COSTA, M.D., LL.D.,
Practice of Medicine.

WM. H. PANCOAST, M.D.,
General, Descriptive, and Surgical Anatomy.

ROBERT E. ROGERS, M.D., LL.D.,
Medical Chemistry and Toxicology.

ROBERTS BARTHOLOW, M.D, LL.D.,
Materia Medica, General Therapeutics, and Hygiene.

HENRY C. CHAPMAN, M.D.,
Institutes of Medicine and Medical Jurisprudence.

SAMUEL W. GROSS, M.D.,
Principles of Surgery and Clinical Surgery.

JOHN H. BRINTON, M.D.,
Practice of Surgery and Clinical Surgery.

THEOPHILUS PARVIN, M.D., LL.D.,
Obstetrics and Diseases of Women and Children.

WILLIAM THOMSON, M.D.,
Professor of Ophthalmology.

To the usual course of instruction in medical schools, the Medical Faculty of this College have added a thorough system of practical Laboratory work. To each department of the regular curriculum there is appended a Laboratory Course, carried on in large and thoroughly equipped apartments in the College, by specially appointed Demonstrators, under the immediate direction of the Professor. In this way each candidate for the degree of M.D. is immediately and personally taught in Obstetrics and Gynæcology, Physical Diagnosis, Laryngology, Ophthalmology, Medical Chemistry, Pharmacy, Materia Medica and Experimental Therapeutics, Physiology, Histology and Experimental Physiology, and Minor Surgery, Bandaging, Operations on the Cadaver, etc. In the Department of Medicine, "clinical conferences," and practical lessons in Physical Diagnosis, give each student familiarity with all forms of disease. The experience of several Sessions has abundantly demonstrated the great value of this Practical Teaching.

This course of Instruction is *free of charge, but obligatory upon* candidates for the Degree, except those who have had such instruction and those who are Graduates of other Colleges of ten years' standing.

A SPRING COURSE of Lectures is given, beginning early in April, and ending in June. There is no additional charge for this Course to matriculates of the College, except a registration fee of five dollars; non-matriculates pay forty dollars, *thirty-five of which, however, are credited on the amount of fees paid for the ensuing Winter Course.*

THE POST-GRADUATE COURSE, instituted last year, has proved an entire success. The subjects taught and the methods employed will be enlarged and improved as the demand for higher professional training increases. Physicians desiring to review former studies, to engage in specialties, or to pursue original investigations, will find the opportunity for these objects in the several departments of post-graduate instruction. The instructors have been selected with reference to their qualifications for teaching the particular subjects to which they have been assigned.

CLINICAL INSTRUCTION is given *daily* at the HOSPITAL OF THE JEFFERSON MEDICAL COLLEGE throughout the year by Members of the Faculty, and by the Hospital Staff, and at the Pennsylvania and other Hospitals several times a week.

FEES.

Matriculation Fee (paid once)	$5 00
Ticket for each Branch (7) $20	140 00
Practical Anatomy	10 00
Graduation Fee	30 00
Fees for a full course of Lectures to those who have attended two full courses at other (recognized) Colleges—the matriculation fee, and	70 00
To Graduates of such Colleges, the matriculation fee and	70 00
To Dental Graduates the first course is $60, and the second is	100 00
To Graduates in Pharmacy the general ticket for each year is	100 00

The Annual Announcement, giving full particulars, will be sent on application to

ROBERTS BARTHOLOW M.D., *Dean.*

Bellevue Hospital Medical College.

CITY OF NEW YORK.

SESSIONS OF 1884–85.

The standard of Medical Ethics recognized by the College is embodied in the Code of Ethics of the American Medical Association.

The COLLEGIATE YEAR embraces the Regular Winter Session and a Spring Session.

The REGULAR SESSION begins on Wednesday, September 17, 1884, and ends about the middle of March, 1885. During this Session, in addition to the regular didactic lectures, two or three hours are daily allotted to clinical instruction. Attendance upon two regular courses of lectures is required for graduation.

The SPRING SESSION consists chiefly of recitations from Text-Books. This Session begins about the middle of March, and continues until the middle of June. During this Session, daily recitations in all the departments are held by a corps of Examiners appointed by the Faculty. Short courses of lectures are given on special subjects, and regular clinics are held in the Hospital and in the College building.

FACULTY.

ISAAC E. TAYLOR, M.D.,
Emeritus Prof. of Obstetrics and Diseases of Women and Children, and President of the Faculty.

FORDYCE BARKER, M.D., LL.D.,
Professor of Clinical Midwifery and Diseases of Women.

BENJAMIN W. McCREADY, M.D.,
Emeritus Professor of Materia Medica and Therapeutics.

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Prof. of the Principles and Practice of Medicine, and Clinical Medicine.

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Professor of Orthopedic Surgery and Clinical Surgery.

ALEXANDER B. MOTT, M.D.,
Professor of Clinical and Operative Surgery.

WILLIAM T. LUSK, M.D.,
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A. A. SMITH, M.D.,
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AUSTIN FLINT, JR., M.D.,
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JOSEPH D. BRYANT, M.D.,
Professor of Anatomy and Clinical Surgery, and Associate Professor of Orthopedic Surgery.

R. OGDEN DOREMUS, M.D., LL.D.,
Professor of Chemistry and Toxicology.

EDWARD G. JANEWAY, M.D.,
Professor of Pathological Anatomy and Clinical Medicine, and Associate Professor of Principles and Practice of Medicine.

PROFESSORS OF SPECIAL DEPARTMENTS, Etc.

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EDWARD L. KEYES, M.D.,
Prof. of Cutaneous and Genito-Urinary Diseases.

JOHN P. GRAY, M.D., LL.D.,
Professor of Psychological Medicine and Medical Jurisprudence.

J. LEWIS SMITH, M.D.,
Clinical Professor of Diseases of Children.

BEVERLY ROBINSON, M.D.,
Clinical Professor of Medicine.

FRANCKE H. BOSWORTH, M.D.,
Professor of Diseases of the Throat.

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LEROY M. YALE, M.D.,
Lecturer Adjunct on Diseases of Children.

GASPAR GRISWOLD, M.D., M.R.C.S.,
Demonstrator of Anatomy.

FEES FOR THE REGULAR SESSION.

Fees for Tickets to all the Lectures, Clinical and Didactic	$140 00
Fees for Students who have attended two full courses at other Medical Colleges, and for Graduates of other Medical Colleges	70 00
Matriculation Fee	5 00
Dissection Fee (including material for dissection)	10 00
Graduation Fee	30 00

No Fees for Lectures are required of third-course Students who have attended their second course at the Bellevue Hospital Medical College.

FEES FOR THE SPRING SESSION.

Matriculation (Ticket valid for the following Winter)	$5 00
Recitations, Clinics and Lectures	40 00
Dissection (Ticket valid for the following Winter)	10 00

For the Annual Circular and Catalogue, giving regulations for graduation and other information, address Prof. AUSTIN FLINT, Jr., Secretary, Bellevue Hospital Medical College.

University of Pennsylvania.

DEPARTMENT OF MEDICINE.

Thirty-Sixth Street and Woodland Avenue (Darby Road), Philadelphia.

One Hundred and Nineteenth Annual Session, 1884-85.

PROFESSORS.

WILLIAM PEPPER, M.D., LL.D., Provost.

HENRY H. SMITH, M.D., Surgery, Emeritus.

ALFRED STILLÉ, M.D., LL.D., Theory and Practice of Medicine, Emeritus.

JOSEPH LEIDY, M.D., LL.D., Anatomy.

RICHARD A. F. PENROSE, M.D., LL.D., Obstetrics and Diseases of Women and Children.

D. HAYES AGNEW, M.D., LL.D., Surgery and Clinical Surgery.

WILLIAM PEPPER, M.D., LL.D., Theory and Practice of Medicine, and Clinical Medicine.

WILLIAM GOODELL, M.D., Clinical Gynæcology.

JAMES TYSON, M.D., General Pathology and Morbid Anatomy.

HORATIO C. WOOD, M.D., Materia Medica, Pharmacy, and General Therapeutics.

THEODORE G. WORMLEY, M.D., LL.D., Chemistry and Toxicology.

JOHN ASHHURST, JR., M.D., Clinical Surgery.

HARRISON ALLEN, M.D., Physiology.

WILLIAM F. NORRIS, M.D., Clinical Professor of Diseases of the Eye.

GEORGE STRAWBRIDGE, M.D., Clinical Professor of Diseases of the Ear.

HORATIO C. WOOD, M.D., Clinical Professor of Nervous Diseases.

LOUIS A. DUHRING, M.D., Clinical Professor of Diseases of the Skin.

JOHN J. REESE, M.D., Medical Jurisprudence and Toxicology.

JOSEPH G. RICHARDSON, M.D., Hygiene.

OTHER INSTRUCTORS.

ROLAND G. CURTIN, M.D., Lecturer on Physical Diagnosis.

CHARLES K. MILLS, M.D., Lecturer on Mental Diseases and Electro-therapeutics.

ADOLPH W. MILLER, M.D., Demonstrator of Practical Pharmacy and Lecturer on Materia Medica and Pharmacy.

DE FORREST WILLARD, M.D., Lecturer on Orthopædic Surgery.

ELLIOTT RICHARDSON, M.D., Demonstrator and Lecturer on Clinical and Operative Obstetrics.

JOHN MARSHALL, M.D., NAT. SC. D., Demonstrator of Practical Chemistry.

BENJAMIN F. BAER, M.D., Demonstrator of Clinical Gynæcology.

EDWARD T. BRUEN, M.D., Demonstrator of Clinical Medicine.

J. WILLIAM WHITE, M.D., Demonstrator of Surgery, and Lecturer on Venereal Diseases.

HARRY R. WHARTON, M.D., Demonstrator of Clinical Surgery.

JOHN B. DEAVER, M.D., Demonstrator of Anatomy.

HENRY F. FORMAD, M.D., Demonstrator of Pathology and Morbid Anatomy, and Lecturer on Experimental Pathology.

EDWARD T. REICHERT, M.D., Demonstrator of Physiology.

GEORGE A. PIERSOL, M.D., Demonstrator of Normal Histology.

WASHINGTON H. BAKER, M.D., Assistant to the Professor of Obstetrics.

J. P. CROZER GRIFFITH, M.D., Assistant Demonstrator of Normal Histology.

GEORGE E. DE SCHWEINITZ, M.D., Prosector to the Professor of Anatomy.

SAMUEL D. RISLEY, M.D., Instructor in Ophthalmology.

W. M. L. ZIEGLER, M.D., Instructor of Otology.

CARL SEILER, M.D., Instructor in Laryngology.

LOUIS STARR, M.D., Instructor in Diseases of Children.

FRANCIS X. DERCUM, M.D., Instructor in Nervous Diseases.

J. HENDRIE LLOYD, M.D., Instructor in Electro-Therapeutics.

A. SYDNEY ROBERTS, M.D., Instructor in Orthopædic Surgery.

HENRY W. STELWAGON, M.D., Instructor in Dermatology.

WILLIAM M. GRAY, M.D., Assistant Demonstrator of Normal Histology.

RICHARD H. HARTE, M.D., THOMAS R. NEILSON, M.D., EDMUND W. HOLMES, M.D., } Assistant Demonstrators of Anatomy.

WM. BARTON HOPKINS, M.D., RICHARD H. HARTE, M.D., THOMAS R. NEILSON, M.D., } Assistant Demonstrators of Surgery.

ALBERT L. A. TOBOLDT, M.D., Assistant Demonstrator of Practical Pharmacy.

WILLIAM A. EDWARDS, M.D., JUDSON DALAND, M.D., } Assistant Demonstrators of Clin. Med.

ARCHER N. RANDOLPH, M.D., GEORGE E. SHOEMAKER, M.D., } Assist. Demonstrators of Physiology.

Students who have not received a collegiate degree or who do not present the evidence of previous education referred to in the Catalogue, are required to pass a preliminary examination in English and Physics for details of which see Catalogue.

Attendance is required upon three winter courses of graded instruction, seven months in duration, and consisting of didactic lectures, *daily* clinical lectures, and practical work in laboratories and hospitals.

A VOLUNTARY FOURTH YEAR, almost purely practical, has been established, in addition to which there is a distinct and separate COURSE FOR GRADUATES, for particulars of which see Catalogue.

The Lectures of the Winter Session of 1884-85 *will begin on Wednesday, October 1st.*

The Preliminary Course will begin on Monday September 15th.

In the *Spring Months* The Laboratories of Chemistry, Pharmacy, Histology, Physiology, and Pathology are open, and the post-graduate clinical instruction is continued

FEES IN ADVANCE.—Matriculation $5. For each Session, including dissections, operating, and bandaging, $150. No graduation fee.

For Catalogue giving full particulars, address

JAMES TYSON, M.D., SECRETARY,
Philadelphia, Pa.

Medical Department of the University of Louisiana—New Orleans.

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T. G. RICHARDSON, M.D.,
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SAMUEL M. BEMISS, M.D.,
Professor of the Theory and Practice of Medicine and Clinical Medicine.

STANFORD E. CHAILLE, M.D.,
Prof. of Physiology and Patholog. Anatomy.

JOSEPH JONES, M.D.,
Prof. of Chemistry and Clinical Medicine.

SAMUEL LOGAN, M.D.,
Professor of Anatomy and Clinical Surgery.

ERNEST S. LEWIS, M.D.,
Professor of General and Clinical Obstetrics and Diseases of Women and Children.

JOHN B. ELLIOTT, M.D.,
Professor of Materia Medica and Therapeutics and Hygiene.

———
Lecturer on Diseases of the Eye.

ALBERT B. MILES, M.D.,
Demonstrator of Anatomy.

The next annual course of instruction in this Department (now in the fifty-first year of its existence) will commence on Monday, the 20th day of October, 1884, and terminate on Saturday the 27th day of March, 1885. The first four weeks of the term will be devoted exclusively to Clinical Medicine and Surgery at the Charity Hospital; Practical Chemistry in the Laboratory; and dissections in the spacious and airy Anatomical Rooms of the University.

The means of teaching now at the command of the Faculty are unsurpassed in the United States. Special attention is called to the opportunities presented for

Clinical Instruction.

The Act establishing the University of Louisiana gives the professors of the Medical Department the use of the great Charity Hospital, as a school of practical instruction.

The Charity Hospital contains nearly 800 beds, and received, during the last year, more than eight thousand patients. Its advantages for practical study are unsurpassed by any similar institution in this country. The Medical, Surgical, and Obstetrical Wards are visited by the respective Professors in charge daily, from eight to ten o'clock A. M., at which time all the Students are expected to attend, and familiarize themselves, AT THE BEDSIDE OF THE PATIENTS, with the diagnosis and treatment of all forms of injury and disease.

The regular lectures at the hospital, on Clinical Medicine by Professors Bemiss and Joseph Jones. Surgery by Professors Richardson and Logan, Diseases of Women and Children by Professor Lewis, and Special Pathological Anatomy by Professor Chaille, will be delivered in the amphitheatre on Monday, Wednesday, Thursday and Saturday, from 10 to 12 o'clock A. M.

The Administrators of the Hospital elect, annually, after competitive examination, FOURTEEN RESIDENT STUDENTS, who are maintained by the Institution.

Terms.

For the Tickets of all the Professors	$140 00
For the Ticket of Practical Anatomy	10 00
Matriculation Fee	5 00
Graduation Fees	30 00

Candidates for graduates are required to be twenty-one years of age; to have studied three years: to have attended two courses of lectures, and to pass a satisfactory examination.*

Graduates of other respectable schools are admitted upon payment of the Matriculation and half lecture fees. They cannot, however, obtain the Diploma of the University without passing the regular examination and paying the usual Graduation Fee.

As the practical advantages here afforded for a thorough acquaintance with all the branches of medicine and surgery are QUITE EQUAL (far superior, in the judgment of disinterested witnesses) to those possessed by the schools of New York and Philadelphia, the same fees are charged.

For further information, address

T. G. RICHARDSON, M.D., Dean.

* For further information upon these points see circular.

Saint Louis Medical College,

ST. LOUIS, MO.

FACULTY.

A. LITTON, M.D., Professor of Chemistry and Pharmacy.

J. B. JOHNSON, M.D., Professor of the Principles and Practice of Medicine.

E. H. GREGORY, M.D., Professor of the Principles and Practice of Surgery and Clinical Surgery.

J. S. B. ALLEYNE, M.D., DEAN, Professor of Therapeutics, Materia Medica, and Diseases of Children.

E. F. SMITH, M.D., Professor of Clinical Medicine and Pathological Anatomy.

L. CH. BOISLINIÈRE, M.D., Professor of Obstetrics.

G. BAUMGARTEN, M.D., Professor of Physiology.

H. H. MUDD, M.D., Professor of Anatomy, and Clinical Surgery at the City Hospital.

W. E. FISCHEL, M.D., Professor of Hygiene and Forensic Medicine.

R. LUEDEKING, M.D., Professor of Pathological Anatomy.

JOHN GREEN, M.D., Lecturer on Ophthalmology.

W. L. BARRET, M.D., Lecturer on Diseases of Women.

J. M. SCOTT, M.D., Lecturer on Clinical Medicine.

G. A. MOSES, M.D., Lecturer on Clinical Gynæcology.

N. B. CARSON, M.D., Assistant to the Chair of Surgery.

W. C. GLASGOW, M.D., Clinical Lecturer on Diseases of the Chest and Laryngology.

J. FRIEDMAN, M.D., Demonstrator of Chemistry.

EDWARD EVERS, M.D., Lecturer on Histology.

JOHN P. BRYSON, M.D., Lecturer on Diseases of the Genito-Urinary Organs.

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FRANK R. FRY, M.D., } of Anatomy.

C. H. HUGHES, M.D., Lecturer on Nervous Diseases.

E. M. NELSON, M.D., Assistant to the Chair of Obstetrics.

HARRY HODGEN, M.D., Curator of the Museum.

In the year 1876 the St. Louis Medical College made its first attempt at a thorough reform in the curriculum of studies by offering an optional graded course of instruction of three years. The number of students who availed themselves of this offer increased so rapidly that, at the end of session 1879–80, two-thirds of the graduates were three years' men. The Faculty therefore resolved to discard the old plan altogether, and made the graded course of three years obligatory. Since the spring of 1880 no student has been matriculated otherwise than for three years, and since the spring of 1882 no candidate has received the diploma who had not passed three courses of lectures.

Thus the St. Louis Medical College has become one of the few medical schools in the United States, and the only one west of the Alleghenies, that has succeeded in establishing a graded course of three years as an ABSOLUTE *condition of graduation.*

COURSE OF STUDIES. *First Term:* Chemistry, with Laboratory Practice, Anatomy, Surgical Anatomy, Dissection, Histology, Physiology, Materia Medica.

Second Term: Chemistry, Anatomy, Surgical Anatomy, Dissection, Physiology, Materia Medica, Pathological Anatomy, Medicine, and Medical, Surgical, and Children's Clinic.

Third Term: Surgical Anatomy, Dissection, Medicine, Surgery, Obstetrics, Diseases of Women, Diseases of Children, Nervous Diseases, Ophthalmology, Hygiene, and Forensic Medicine; and Medical, Surgical, Children's, Ophthalmic, Gynæcological, and Genito-Urinary Clinics.

FEES: Matriculation . . . . . $ 5.
For each term . . . . . 90.

An examination for admission is required of all except college or high school graduates.

The forty-third regular session will begin on Monday, September 22, 1884, and continue until March 1, 1885.

All further information, as well as annual announcements, may be obtained by addressing the Dean,

J. S. B. ALLEYNE, M.D.,
3132 Washington Avenue, St. Louis.

Chicago Medical College.

MEDICAL DEPARTMENT OF THE NORTHWESTERN UNIVERSITY.

SESSION 1884-85.

H. A. JOHNSON, A.M., M.D.,
Emeritus Professor of the Principles and Practice of Medicine and Clinical Medicine.

J. S. JEWELL, A.M., M.D.,
Emeritus Professor of Nervous and Mental Diseases.

N. S. DAVIS, M.D., LL.D., DEAN,
Professor of the Principles and Practice of Medicine and of Clinical Medicine.

EDMUND ANDREWS, M.D., LL.D.,
Professor of Clinical Surgery.

RALPH N. ISHAM, M.D.,
Professor of the Principles and Practice of Surgery.

JOHN H. HOLLISTER, A.M., M.D.,
Professor of Clinical Medicine.

E. O. F. ROLER, A.M., M.D.,
Professor of Obstetrics.

S. J. JONES, A.M., M.D.,
Professor of Ophthalmology and Otology.

M. P. HATFIELD, A.M., M.D.,
Professor of Diseases of Children.

LESTER CURTIS, A.B., M.D.,
Professor of Histology and Practical Microscopy.

JOHN H. LONG, Sc.D.,
Professor of General and Medical Chemistry.

E. C. DUDLEY, A.B., M.D.,
Professor of Gynæcology.

JOHN E. OWENS, M.D.,
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F. C. SCHAEFER, M.D.,
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OSCAR C. DEWOLF, A.M., M.D.,
Professor of State Medicine and Public Hygiene.

WALTER HAY, M.D., LL.D., SECRETARY,
Professor of Nervous and Mental Diseases and Medical Jurisprudence.

CHRISTIAN FENGER, M.D.,
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Professor of Clinical Medicine.

W. E. CASSELBERRY, M.D.,
Professor of Materia Medica and Therapeutics.

R. W. BISHOP, M.D.,
Professor of Physiology.

W. W. JAGGARD, M.D.,
Adjunct Professor of Obstetrics.

A. G. PAINE, A.M., M.D.,
Lecturer on Dermatology.

FRANK BILLINGS, M.D.,
Demonstrator of Anatomy and Lecturer on Physical Diagnosis.

F. S. JOHNSON, A.M., M.D.,
Lecturer on Histology.

N. S. DAVIS, JR., M.D.,
Lecturer on General Pathology and Pathological Anatomy.

The Collegiate Year in this Institution consists of a REGULAR AUTUMN AND WINTER SESSION, and a special SESSION FOR PRACTITIONERS. THE REGULAR SESSION begins September 23, 1884, and closes March 24, 1885.

This College was the first in the United States to adopt a graded system of instruction. All applicants for admission must possess at least a good English education, and present full evidence of the same. If an applicant has received the degree of A.B., or presents a certificate from some reputable Scientific School, High School, or Academy, no matriculation examination will be required; otherwise he must sustain a satisfactory examination before a committee of the Faculty. The students are divided into 1ST YEAR, 2D YEAR, and 3D YEAR CLASSES, instructions being given simultaneously in different lecture rooms.

The Clinical advantages of this College, with the great number of Dispensary, College Clinic and Hospital patients, cannot be surpassed. All professors of practical branches are members of the staffs of Mercy, St. Luke's, Michael Reese, Cook County Hospitals, and other charities. For several sessions each senior student has had the privilege of attending upon one or more obstetrical cases, and of witnessing important obstetrical operations.

It is the aim of the Faculty to make all instruction in the College pre-eminently practical.

THE PRACTITIONERS' COURSE, designed for Practising Physicians only, was inaugurated in 1880. It has proven so satisfactory to all concerned that it will be continued and constitute a portion of each Collegiate year. This course will begin the day following the public Commencement exercises, and continue for four weeks, affording, by means of didactic and daily clinical instruction, special advantages to physicians for a rapid, yet thorough, practical review of the most important subjects in Medicine and Surgery.

FEES FOR COLLEGIATE YEAR (except Practitioners' Course), $75. Registration Fee, $5. Demonstrator's Ticket, $5. Laboratory Ticket, $5. Mercy Hospital Ticket, $6. St. Luke's Hospital Ticket, $5. Final Examinati n Fee, $30. For Practitioners' Course, including Laboratory, Anatomical, and Hospital Tickets, $30.

For the Annual Announcement and Catalogue, or for any information relating to the College, address

WALTER HAY, M.D., LL.D., Secretary,
243 State Street, Chicago, Illinois.

HARVARD UNIVERSITY,

MEDICAL DEPARTMENT, BOSTON, MASS.

ONE HUNDRED AND SECOND ANNUAL ANNOUNCEMENT (1884-1885).

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OLIVER W. HOLMES, M. D., LL. D., Professor of Anatomy, Emeritus.

HENRY J. BIGELOW, M. D., LL. D., Professor of Surgery, Emeritus.

FRANCIS MINOT, M. D., Hersey Professor of the Theory and Practice of Physic.

JOHN P. REYNOLDS, M. D., Professor of Obstetrics.

_____, Jackson Professor of Clinical Medicine.

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DAVID W. CHEEVER, M. D., Professor of Surgery.

JAMES C. WHITE, M. D., Professor of Dermatology.

ROBERT T. EDES, M. D., Professor of Materia Medica.

CHARLES F. FOLSOM, M. D., Assistant Professor of Mental Diseases.

FREDERICK I. KNIGHT, M. D., Assistant Professor of Laryngology.

CHARLES B. PORTER, M. D., Assistant Professor in Surgery.

J. COLLINS WARREN, M. D., Assistant Professor in Surgery.

REGINALD H. FITZ, M. D., Shattuck Professor of Pathological Anatomy.

WILLIAM L. RICHARDSON, M. D., Assistant Professor of Obstetrics.

THOMAS DWIGHT, M. D., Parkman Professor of Anatomy.

EDWARD S. WOOD, M. D., Professor of Chemistry.

WILLIAM H. BAKER, M. D., Assistant Professor of Gynæcology.

WILLIAM B. HILLS, M. D., Instructor in Chemistry.

WILLIAM F. WHITNEY, M. D., Curator of the Anatomical Museum.

MAURICE H. RICHARDSON, M. D., Demonstrator of Anatomy, and Assistant in Surgery.

OTHER INSTRUCTORS.

SAMUEL H. DURGIN, M. D., Lecturer on Hygiene.

FRANK W. DRAPER, M. D., Lecturer on Forensic Medicine.

HENRY P. QUINCY, M. D., Instructor in Histology.

EDWARD N. WHITTIER, M. D., Instructor in the Theory and Practice of Physic.

FRANCIS A. HARRIS, M. D., Demonstrator of Medico-Legal Examinations.

WILLIAM P. BOLLES, M. D., Instructor in Materia Medica.

EDWARD H. BRADFORD, M. D., Assistant in Clinical Surgery.

FRANCIS H. DAVENPORT, M. D., Assistant in Gynæcology.

GEORGE M. GARLAND, M. D., Assistant in Clinical Medicine.

JOSEPH W. WARREN, M. D., Assistant in Physiology.

WILLIAM W. GANNETT, M. D., Assistant in Pathological Anatomy.

CHARLES M. GREEN, M. D., Assistant in Obstetrics.

CHARLES S. MINOT, S. D., Lecturer on Embryology.

WILLIAM C. EMERSON, M. D., Assistant in Chemistry.

WALTER J. OTIS, M. D., Assistant in Anatomy.

SAMUEL J. MIXTER, M. D., Assistant in Anatomy.

CHARLES HARRINGTON, M. D., Assistant in Chemistry.

The following gentlemen will give special clinical instruction:

JOHN HOMANS, M. D., in the Diagnosis and Treatment of Ovarian Tumors.

FRANCIS B. GREENOUGH, M. D., and ABNER POST, M. D., in Syphilis.

OLIVER F. WADSWORTH, M. D., in Ophthalmoscopy.

J. ORNE GREEN, M. D., and CLARENCE J. BLAKE, M. D., in Otology.

AMOS L. MASON, M. D., and FREDERICK C. SHATTUCK, M. D., in Auscultation.

JOSEPH P. OLIVER, M. D., and THOMAS M. ROTCH, M. D., in Diseases of Children.

SAMUEL G. WEBBER, M. D., and JAMES J. PUTNAM, M. D., in Diseases of the Nervous System.

JAMES R. CHADWICK, M. D., in Gynæcology.

A new Building has just been completed at a cost of more than a quarter of a million of dollars. Its numerous apartments are spacious, well lighted, and provided with carefully contrived apparatus for heating and ventilation. The comfort and convenience of the students have been constantly borne in mind in the arrangement of rooms, the construction of seats, and in the furnishing of the various laboratories, halls for lectures, and rooms for recitations, study, and conversation. The building is devoted to laboratory instruction and didactic teaching, while the general and special clinics take place at the various hospitals and dispensaries. Greatly enlarged and improved facilities are offered at the Massachusetts General Hospital and the Boston Dispensary, both of which institutions have recently constructed buildings to meet the constantly increasing demands for their usefulness.

Every candidate for admission not holding a degree in arts or science must pass a written examination on entrance to this School, in English, Latin, Physics, and any one of the following subjects: French, German, Elements of Algebra or of Plane Geometry, Botany. The admission examination for 1884-85 will be held June 23d, at Boston, June 26th, at Exeter, Andover, New York, Phildelphia, Chicago, Cincinnati, St. Louis, and San Francisco; on September 22d, at Boston only.

Medical Department of Harvard University, Annual Announcement—(Continued).

Instruction is given by lectures, recitations, clinical teaching, and practical exercises, distributed throughout the academic year. In the subjects of Anatomy, Histology, Chemistry, and Pathological Anatomy, laboratory work is largely substituted for, or added to, the usual methods of instruction. The year begins September 25, 1884, and ends on the last Wednesday in June, 1885, and is divided into two equal terms.

Students are divided into four classes, according to their time of study and proficiency, and during their last year will receive largely increased opportunities for instruction in the special branches mentioned. Students who began their professional studies elsewhere may be admitted to advanced standing; but all persons who apply for admission to the advanced classes must pass an examination in the branches already pursued by the class to which they seek admission.

Although the course of study recommended by the Faculty covers four years, until further notice the degree of Doctor of Medicine will continue to be given upon the completion of three years of study, to be as ample and full as heretofore. The degree of Doctor of Medicine *cum laude* will be given to candidates who have pursued a complete four years' course, and obtained an average of 75 per cent. upon all the examinations of this course. In addition to the ordinary degree of Doctor of Medicine as hitherto obtained, a certificate of attendance on the studies of the fourth year will be given to such students desiring it as shall have attended the course, and have passed a satisfactory examination in the studies of the same.

ORDER OF STUDIES.—FOUR YEARS' COURSE.

For the First Year.—Anatomy, Physiology, and General Chemistry.

For the Second Year.—Practical and Topographical Anatomy, Medical Chemistry, Materia Medica, Pathological Anatomy, Clinical Medicine, Surgery, and Clinical Surgery.

For the Third Year.—Therapeutics, Obstetrics, Theory and Practice of Medicine, Clinical Medicine, Surgery, and Clinical Surgery.

For the Fourth Year.—Ophthalmology, Otology, Dermatology, Syphilis, Laryngology, Mental Diseases, Diseases of the Nervous System, Diseases of Women, Diseases of Children, Obstetrics, Clinical and Operative Obstetrics, Clinical Medicine, Clinical and Operative Surgery, Forensic Medicine.

THREE YEARS' COURSE.

For the First Year.—Anatomy, Physiology, and General Chemistry.

For the Second Year.—Practical and Topographical Anatomy, Medical Chemistry, Materia Medica, Pathological Anatomy, Clinical Medicine, and Clinical Surgery.

For the Third Year.—Therapeutics, Obstetrics, Theory and Practice of Medicine, Clinical Medicine, Surgery, Clinical Surgery, Ophthalmology, Dermatology, Syphilis, Otology, Laryngology, Mental Diseases, Diseases of the Nervous System, Diseases of Women, Diseases of Children, Forensic Medicine.

ANNUAL EXAMINATIONS.

At the end of the first year—Anatomy, Physiology, and General Chemistry.

End of second year—Topographical Anatomy, Medical Chemistry, Materia Medica, and Pathological Anatomy.

End of third year—Therapeutics, Obstetrics, Theory and Practice of Medicine, Surgery. (Students of the three years' course are also examined in Clinical Medicine and Clinical Surgery.)

End of fourth year—Ophthalmology, Otology, Dermatology, Syphilis, Laryngology, Mental Diseases, Diseases of the Nervous System, Diseases of Women, Diseases of Children, Obstetrics, Clinical and Operative Obstetrics, Clinical Medicine, Clinical and Operative Surgery, Forensic Medicine.

Examinations in all subjects are also held before the opening of the School, beginning September 26th.

REQUIREMENTS FOR A DEGREE.—Every candidate must be twenty-one years of age; must have studied medicine three or four full years, have spent at least one continuous year at this School, have passed a written examination upon all the prescribed studies of the course taken, and have presented a thesis.

COURSE FOR GRADUATES.—For the purpose of affording to those already Graduates of Medicine additional facilities for pursuing clinical, laboratory, and other studies, the Faculty has established a course which comprises all of the special subjects of the fourth year in addition to private instruction in Histology, Physiology, Medical Chemistry, and Pathological Anatomy. Any or all branches may be pursued.—If the full fee is paid, the privilege of attending any of the other exercises of the Medical School, the use of the laboratories and library, and all other rights accorded by the University will be granted. Graduates of other Medical Schools who may desire to obtain the degree of M. D. at this University will be admitted to examination for this degree after a year's study in the Graduates' Course. Examination on entrance not required.

FEES.

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For the Year	200 00
For one term alone	120 00
For Graduation	30 00
For Graduates' Course, the fee for one year is	200 00
For one Term	120 00

and for single courses such fees as are specified in the Catalogue. Payment in advance, or if a bond is filed, at the end of the term.

Students in regular standing in any one department of Harvard University are admitted free to the lectures, recitations, and examinations of other departments.

For further information, or Catalogue, with an illustrated description of the New Building, address

DR. H. P. BOWDITCH, *Dean*,
Harvard Medical School, Boston, Mass.

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The printed prices are those at which books can generally be supplied by booksellers throughout the United States, who can readily procure for their customers any works not kept in stock. Where access to bookstores is not convenient, books will be sent by mail postpaid on receipt of the price, and as the limit of mailable weight has been removed, no difficulty will be experienced in obtaining through the post-office any work in this catalogue. No risks, however, are assumed either on the money or on the books, and no publications but our own are supplied, so that gentlemen will in most cases find it more convenient to deal with the nearest bookseller.

A handsomely illustrated catalogue will be sent to any address on receipt of a two-cent stamp.

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profession, and in every issue living topics are editorially discussed in a scholarly and practical manner; its corps of qualified reporters and correspondents covers all the medical centres of both hemispheres, and secures for its columns the earliest information on matters of medical interest, and its reports of Medical Progress are culled from all the important professional journals published on both continents. In short, its unrivaled organization enables THE NEWS each week to lay upon the table of its readers an epitome of a week's advance of the whole medical world.

THE NEWS, always endeavoring to enhance its usefulness, has pleasure in announcing to the profession that arrangements have been perfected for the publication during this year of a highly valuable series of practical articles by eminent men on the more important diseases met with by every practitioner in his daily duties. The following gentlemen have kindly promised to aid in carrying out this plan, and the eminence of their names is a guarantee of the value of the papers to be contributed by them.

D. HAYES AGNEW, Philadelphia.
HARRISON ALLEN, Philadelphia.
I. E. ATKINSON, Baltimore.
ROBERTS BARTHOLOW, Philadelphia.
S. M. BEMISS, New Orleans.
L. DUNCAN BULKLEY, New York.
CHARLES H. BURNETT, Philadelphia.
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WILLIAM F. NORRIS, Philadelphia.
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FESSENDEN N. OTIS, New York.
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THEOPHILUS PARVIN, Philadelphia.
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LEWIS A. STIMSON, New York.
ROBERT W. TAYLOR, New York.
WILLIAM THOMSON, Philadelphia.
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JAMES TYSON, Philadelphia.
ELY VAN DE WARKER, Syracuse, N. Y.
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JAMES T. WHITTAKER, Cincinnati.
EDWARD WIGGLESWORTH, Boston.
E. WILLIAMS, Cincinnati.
DAVID W. YANDELL, Louisville.

Original articles from foreign authorities may also be expected, the first of which appeared in the issue of January 5th, 1884, on DIGITAL EXPLORATION OF THE BLADDER IN OBSCURE VESICAL DISEASE, WITH ITS RESULTS, with 7 original illustrations, by SIR HENRY THOMPSON, of London, Surgeon Extraordinary to the King of the Belgians, etc. From the high character of the articles already published, a fair conception may be formed of the value of the series to every professional man in active practice.

In typographical appearance, THE NEWS of 1884 shows an advance even upon the issues of 1882–83, and nothing has been left undone to economize the time and promote the comfort of its readers. It appears in a double-columned quarto form, printed by the latest improved Hoe speed presses, on handsome paper, from a clear, easily read type, specially cast for its use.

THE MEDICAL NEWS employs all the approved methods of modern journalism with the intention of rendering itself indispensable to the profession; and, in the anticipation of an unprecedented circulation, its subscription has been placed at the exceedingly low rate of $5 per annum, in advance. At this price it ranks as the cheapest medical periodical in this country, and when taken in connection with THE AMERICAN JOURNAL at **NINE DOLLARS** per annum, it is confidently asserted that a larger amount of material of the highest class is offered than can be obtained elsewhere, even at a much higher price.

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